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IFB NO. Y18-753-RC **ISSUED: March 21, 2018**

INVITATION FOR BIDS

FOR

INTERNAL OPERATIONS CENTER I HUMAN RESOURCES SERVICE CENTER RENOVATIONS PHASE II & III

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PART H
TECHNICAL SPECIFICATIONS

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PART H
Volume II

Permit Documents
ARCHITECTURAL DESIGN COLLABORATIVE

PROJECT MANUAL

FOR THE

INTERNAL OPERATIONS CENTER I
1ST AND 2ND FLOOR ALTERATIONS
HUMAN RESOURCES DIVISION
400 EAST SOUTH STREET

PREPARED FOR

Orange County Capital Projects Division
Internal Operations Center II
400 East South Street, 5th Floor
Orlando, Florida 32801

January 24, 2017

SECTION 00 0103
STATEMENT OF COMPLIANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. To the best of my knowledge the Plans and Specifications comply with the applicable minimum building codes and the applicable fire-safety standards as determined by the local authority in accordance with this Section and 633 Florida Statutes.

B. Reference Article 101.4 Applicability, Paragraph 101.4.2 Building of the FBC.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION 00 0103

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SECTION 01005
ADMINISTRATIVE PROVISIONS

PART I GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Work of this Contract comprises building and related construction work to produce a complete and functional facility including but not limited to plumbing, mechanical, and electrical for the construction of 1st and 2nd floor Alterations, Human Resources Division

1.2 CONTRACT METHOD

A. Construct the work under a single lump sum contract (or as otherwise defined in bid documents).

1.3 COORDINATION

A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

B. Verify characteristics of elements of interrelated operating equipment are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connecting to and placing in service, such equipment. Differences shall be brought to the Owner's attention during bid process or remain the responsibility of the Contractor.

C. Coordinate space requirements and installation of items, such as, but not limited to, mechanical and electrical work which are indicated diagrammatically or otherwise on drawings. Follow routing shown for pipes, ducts and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

D. In finished areas (except as otherwise shown), conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Execute cutting and patching to integrate elements of work, uncover ill timed, defective and nonconforming work, provide openings for penetrations of existing surfaces and provide samples as specified in individual sections for testing. Seal penetrations of existing surfaces and provide samples as specified in individual sections for testing. Seal penetrations through floors, walls and ceilings, and fire safe where necessary as part of the lump sum price.

1.4 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect when a specified date is specified.

1.5 SUBMITTALS

A. Obtain copies of referenced standards listed in individual specification sections. Maintain copy at job site during progress of the specific work.

END OF SECTION 01005

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 PROJECT DESCRIPTION

A. Performance of all tasks specified in the contract documents shall be the responsibility of the contractor unless specified otherwise.

1.03 BUILDING/SITE SECURITY

A. No exterior staging area will be required.

1.04 CONTRACTOR USE OF PREMISES

A. General: Limited use of the premises to construction activities in areas indicated within the limit of the premises. Site staging areas will not be provided. Deliveries to be made as to not overburden construction activities. Storage to be in restrooms being renovated.

1. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Burial of Waste Materials: Do not dispose of organic and hazardous material on site, either by burial or by burning.

3. Comply with Owner's requirements for ingress and egress procedures, prohibitions against firearms, procedures for transportation of workers, safety and fire prevention requirements, and all applicable pollution control requirements. Refer to the following reference documents:

   a. Orange County Safety and Health Manual
   b. Orange County Policy Manual (pg. 96 regarding firearms)

4. Require all employees and subcontractors to wear no-objectionable clothing; prohibit revealing clothing and articles of clothing with offensive writing displayed. Remove from premises all personnel until such clothing is changed.

5. All personnel shall abide by the Orange County Tobacco Free policy while on any Orange County property. Policy applies to buildings, parking lots, parks, break areas, and work sites. Tobacco products are defined as cigars, cigarettes, pipes, e-cigs, chewing tobacco and snuff. Failure to abide by the policy may result in civil penalties levied under Chapter 386, Florida Statutes and

Contract enforcement remedies.

1.05 DISTRIBUTION OF RELATED DOCUMENTS

A. The Contractor is solely responsible for the distribution of ALL related documents/drawings to ALL appropriate vendors/subcontractors to ensure proper coordination of all aspects of the project and its related parts during bidding and construction.

1.06 CONSTRUCTION BULLETIN BOARD

A. The Contractor shall erect and maintain a weather protected bulletin board of sufficient size to display all permits, notices and other documents required to be posted for the Project. Said bulletin board shall be located per Owner's direction.

1.07 SECURITY AND IDENTIFICATION

A. The building (construction area) shall be secured from unwanted entry at the end of each work day.

B. All costs for background investigations will be the Contractor's responsibility. The County shall have the right to request any additional investigative background information including, but not limited to, employment records, Right-to Know records, E-verify system records (If the contractor uses this service as a means to determine employee eligibility), training records, payroll records, position for which hired including site location of any personnel assigned to perform the services. Furnish, in writing, all such information to the extent allowed by law, prior to commencement of services. The County reserves the right to conduct its own investigation of any employee or subcontractor of the Contractor.

C. Background Checks for the Contractor's staff must be approved by Orange County's security team prior to working in any County facility. Obtain necessary forms for background checks for work at Orange County. All Contractor's staff background checks will be sent to the Orange County project Manager for approval.

D. For security purposes and to maintain privacy, please submit a FDLE Background Checks via email. The subject line of the email must contain the following ***EXEMPT***

E. Orange County will inform the Contractor of their Background Check results. Upon Background Check approval, the contractor's staff shall arrange an appointment with the Orange County staff to obtain an Orange County ID Badge. An Affidavit of Identity form (Issued by Contractor) and a State of Florida ID or Driver's License will be required.

F. Contractor's employees will not be allowed in Orange county facilities without completed and approved background investigations.

1.08 BUILDING/SITE SECURITY REQUIREMENTS

A. Lock restrooms at the end of each day to secure construction items and Work

1.09 OWNER OCCUPANCY

A. The Owner will occupy the building and areas next to the Work area. Normal hours are 7:00 AM to 5:00 PM Monday thru Friday. Coordinate with the Owner's representative for Work areas that can be performed on during normal work hours. Work can be performed after hours provided the area where Work is done is fully operational and back in original condition prior to beginning the next business day. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. A certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy

2. Obtain a Certificate of Occupancy from the local building officials prior to Owner occupancy.

3. Prior to partial occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

PART 2 PRODUCTS

2.01 ASBESTOS FREE MATERIAL

A. Contractor shall provide a written and notarized statement on company letterhead(s) to certify and warrant that ONLY ASBESTOS FREE MATERIALS AND PRODUCTS were provided as required by the Architect in Section 01400, QUALITY CONTROL. Such statement shall be submitted with the final payment request. Final payment shall not be made until such statement is submitted. Contractor agrees that if materials containing asbestos are subsequently discovered at any future time to have been included in the construction, the Contractor shall be liable for all costs related to the redesign or modification of the construction of the project so that materials containing asbestos are removed from the facility. If construction has begun or has been completed pursuant to a design that includes asbestos containing materials, the Contractor shall also be liable for all costs related to the abatement of such asbestos.

PART 3 EXECUTION (Not applicable).

END OF SECTION 01010

SECTION 01027
APPLICATION FOR PAYMENT

PART I GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B. The Contractor's Construction Schedule and Submittal Schedule are included in Section 01300 – SUBMITTALS.

1.03 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Submit the Schedule of Values to the Owner at the earliest feasible date, but in no case later than Preconstruction Meeting. Refer to Section 01200.

2. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following project identification on the Schedule of Values:

   a. Project name and location.
   b. Name of the Architect
   c. Project Number
   d. Contractor's name and address
   e. Date of submittal

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

   a. Generic name
   b. Related Specification Section
   c. Change Orders (numbers) that have affected value
   d. Dollar Value
   e. Percentage of Contract Sum to the nearest one-hundredth percent,

adjusted to total 100 percent

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items:

   a. A value will be given for at least every major specification section (subsections can logically be grouped together).
   b. A single material subcontractor (i.e. sod, window blinds) will not be required to be broken down into labor and material unless it is anticipated the materials will be stored and invoiced prior to installation.
   c. All multiple item subcontracts or work items (i.e. concrete, roofing, painting, mechanical, electrical items, etc.) will be shown broken down at least in labor and material (all taxes, burden and overhead and profit included).
   d. Mobilization (move-on, bond, insurance, temporary office and sanitary service installation) shall not exceed 2 1/2% of contract price.
   e. For multi-story work all items broken down per floor.
   f. Concrete broken down at least into foundation slab on grade, columns, beams and suspended slabs.
   g. Masonry divided into C.M.U. brick, stem walls, exterior walls, interior walls and elevator shaft.
   h. Plumbing broken down at least into underslab rough-in, vents and stacks supply piping, equipment items (each listed separately), fixtures and trim.
   I. HVAC: Typically shown per specification section, labor and material, per floor.
   j. Electrical: same as HVAC.
   k. Fire protection broken down at least into underground, rough-in and trim. All per building and labor and material.
   l. Logical grouping of specification subsections is permitted.

4. Round amounts off the nearest whole dollar, the total shall equal the Contract Sum.
5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

   a. At the Contractors' option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as

general overhead expense.

7. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the contract sum.

1.04 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as reviewed by the Owner representative and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the Final Application for Payment involve additional requirements.

B. Payment Application Times: The period of construction work covered by each Application of Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use the County's most updated form as the form for Application for Payment. Form given at the Preconstruction Conference.

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.

1. Entries shall match data on the Schedule of Values and Contractors' Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit five (5) original executed copies of each Application for Payment to the Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Project Manager.

F. Payment will be processed once a month. Payment for item will be based on percentage completed as determined and approved by the County Project Manager or invoice for stored materials. Retainage (10%) will be held for all applications.

G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Application

shall also include all items listed in Part H. above.

H. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment. Application for Payment includes the following:

1. Completion of Project Close-Out requirements
2. Completion of items specified for completion after Substantial Completion (Punch List)
3. Contractor's release of lien (on Owner's form)
4. Subcontractor and material supplier release of lien (If applicable)
5. Consent of Surety
6. Power of attorney
7. Asbestos-free letter

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01035
MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.03 MINOR CHANGES IN THE WORK

A. Supplemental instructions authorizing minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Project Manager.

1.04 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Proposed changes in the work that will require adjustment to the Contract Sum or Contract Time will be issued by the Project Manager, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.

1. Proposal requests issued by the Project Manager are for information only. Do not consider them instruction either to stop work in progress, or to execute the proposed change.

2. Unless otherwise indicated in the proposal request, within 7 days of receipt of the proposal request, submit to the Project Manager from the Owner's review, an estimate of cost necessary to execute the proposed change.

    a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include a statement indicating the effect the proposed change in the work will have on the Contract Time.
    d. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amount.

B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions in mutual accord with the Owner Representativeэs findings require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.

2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Comply with requirements in Section 01631 – Product Substitutions- if the proposed change in the work requires that substitution of one product or system for a product or system not specified.

5. Contractor and subcontractors will provide a complete detailed labor and material breakdown to justify change order request amounts.

1.05 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Project Manager may issue a Construction Change Directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.07 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Change Order Proposal Request, the Project Manager will issue a Change Order for signatures of the Owner and Contractor on County's Change Order form, as provided in the Conditions of the Contract.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040
PROJECT COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and supervisory requirements necessary for project coordination including, but not necessarily limited to:

1. Coordination
2. Administrative and supervisory personnel
3. General installation provisions
4. Cleaning and protection

B. Progress meetings, coordination meetings And Pre-installation conferences are included in Section 01200 ‘Project Meetings’.

C. Requirements for the Contractor’s Construction Schedule are included in Section 01300 ‘Submittals’.

1.03 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specification that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required: notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where

coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Schedules
2. Installation and removal of temporary facilities
3. Delivery and processing of submittals
4. Progress meetings
5. Project close-out activities

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment (if any) involved in performance of, but not actually incorporated in, the Work.

E. Lack of coordination as specified in this and other sections of the contract documents are in grounds for assessment of back charges and/or termination in order to remediate the situation.

1.04 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.

2. Indicate required installation sequences.

3. Comply with requirements contained in Section Submittals.

4. Refer to Facility Services documents for specific coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: At the Preconstruction Conference submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1. Post copies of the list in the project meeting room, the temporary field office, and each temporary telephone.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to Project Manager for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect/Project Manager for final decision.

3.02 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as directed by the Project Manager and as frequently as necessary to ensure its integrity and safety through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where the applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading
2. Excessively high or low temperatures
3. Excessively high or low humidity
4. Air contamination or pollution
5. Water
6. Solvents
7. Chemicals
8. Soiling, staining and corrosion
9. Rodent and insect infestation
10. Combustion
11. Destructive testing
12. Misalignment
13. Excessive weathering
14. Unprotected storage
15. Improper shipping or handling
16. Theft
17. Vandalism

END OF SECTION 01040

SECTION 01045
CUTTING AND PATCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1. Requirements of this Section apply to mechanical and electrical installations. Refer to Facility Services Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.03 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.

6. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

7. Approval by the Architect to proceed with cutting and patching does not

waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.04 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements.

a. Structural concrete
b. Structural steel
c. Lintels
d. Miscellaneous structural metals
e. Piping, ductwork, vessels and equipment

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems.

a. Shoring, bracing and sheeting
b. Primary operational systems and equipment
c. Air or smoke barriers
d. Fire protection systems
e. Control systems
f. Communication systems
g. Electrical wiring systems

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually unsatisfactory manner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect unless otherwise indicated by Architect/Owner. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

1. Before proceeding, meet at the site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas and interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer’s recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a Carborundum saw or diamond core drill.

4. Comply with requirements of applicable Sections of Division-2 where cutting and patching required excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials if necessary to achieve uniform color and appearance.

a. Where patching occurs in smooth painted surfaces, extend final coat over entire unbroken surfaces containing the patch, after the patched area has received primer and second coat.

3.04 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged materials to their original condition.

END OF SECTION 01045

SECTION 01095
REFERENCE STANDARDS AND DEFINITIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. Indicated: The term *indicated* refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as shown, noted, scheduled and specified are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as directed, requested, authorized, selected, accepted, required, and permitted mean directed by the Project Manager, requested by the Architect/Project Manager and similar phrases.

D. Approved: This term approved means accepted, where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term Regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term furnish is used to mean supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. Install: The term install is used to describe operations at project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. Provide: The term provide means to furnish and install, complete and ready for the intended use.

I. Installer: An Installer is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term experienced, when used with the term Installer, means having a

minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

2. Trades: Use of titles such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

J. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. Testing Laboratories: A testing laboratory is an independent entity engaged to perform specific inspections or tests, either at the Project sites or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

L. Florida Building Code (FBC): Where the term or acyronym is used it will mean the current edition of the Florida Building Code with all applicable revisions adopted by the authorities having jurisdictions at the location of the Project.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16 Division format and MASTER FORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meaning shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

a. The words, shall be shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copies directly into the Contract Documents to the extend reference. Such standards are made part of the Contract Documents by reference.

B. Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliances with two or more standards are specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity of quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect/Owner for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for performance of a required construction activity. The Contractor shall obtain copies directly from the publication source or any other authorized source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. See Trade Reference List at the end of this Section refer to the Encyclopedia of Associations, published by Gale Research Co., available in most libraries.

1.05 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulation bearing upon performance of the Work.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 01095

SECTION 01200
PROJECT MEETINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference
2. Pre-Installation Conference
3. Coordination Meetings
4. Progress Meetings

B. Construction schedules are specified in Section 01300 Submittals.

1.03 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the project site or other convenient location no later than 20 days after execution of the agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees: The OWNER'S Representative, Architect, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule
2. Critical Work sequencing and/coordinating
3. Designation of responsible personnel
4. Procedures for processing field decisions and Change Orders
5. Procedures for processing Applications for Payment
6. Distribution of Contract Documents
7. Submittal of Shop Drawings, Product Data and Samples
8. Preparation of record documents
9. Use of the Premises
10. Office, Work and storage areas
11. Equipment deliveries and priorities
12. Safety procedures

13. First aid
14. Security
15. Housekeeping
16. Working hours

D. Contractor must submit at the time of the meeting at least the following items:

1. Schedule of Values
2. Listing of key personnel including project superintendent and subcontractors with their addresses, telephone numbers, and emergency telephone numbers.
3. Preliminary Construction Schedule
4. Submittal Schedule

1.04 PRE-INSTALLATION CONFERENCE

A. Conduct a Pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise at least 48 hours in advance the Project Manager of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

a. Contract Documents
b. Options
c. Related Change Orders
d. Purchases
e. Deliveries
f. Shop Drawings, Product Data and Quality Control Samples
g. Possible conflicts
h. Compatibility problems
I. Time schedules
j. Weather limitations
k. Manufacturer's recommendations
l. Comparability of materials
m. Acceptability of substrates
n. Temporary facilities
o. Space and access limitations
p. Governing regulations
q. Safety
r. Inspection and testing requirements
s. Required performance results
t. Recording requirements
u. Protection

2. Record significant discussions, agreements, and disagreements of each

conference along with an approved schedule. Distribute the record of the meeting to everyone concerned promptly including the Owner and Architect.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.05 COORDINATION MEETINGS

A. Conduct project coordination meeting at weekly intervals on day and time as established by the Project Manager or more frequently, if necessary convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved, to include subcontractors and representatives.

C. Contractor shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.06 PROGRESS MEETINGS

A. Conduct progress meetings at the Project site at bimonthly intervals or more frequently if necessary as directed by the Project Manager. Notify the Owner at least 48 hours in advance of scheduled meeting time and dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress of involved in planning, coordination or performance of future activities with the project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time, ahead, or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including such items as:

a. Interface requirements
b. Time
c. Sequences
d. Deliveries
e. Off-site fabrication problems
f. Access
g. Site utilization
h. Temporary facilities and services
I. Hours of work
j. Hazards and risks
k. Housekeeping
l. Quality and work standards
m. Change Orders
n. Documentation of information for payment requests.

D. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, or progress since the previous meeting and report.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION 01200

SECTION 01 2301
ADDITIVE OR DEDUCTIVE BID ITEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing additive and deductive bid items.

1.2 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to integrate work of additive or deductive bid item into the Project.

B. Include as part of each additive or deductive bid item, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

C. Execute accepted additive or deductive bid items under the same conditions as other Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Amount listed for each additive or deductive bid item shall include related coordination, modifications, and adjustments to adjoining and related work, including administrative activities.

3.2 SCHEDULE OF ADDITIVE BID ITEMS

A. Additive bid item No. 01

1. Base Bid Double Door Removal: 0.00 dollars as not work would be involved

2. Double Door Removal: State the amount to be added to the Base Bid for providing all work including labor, materials, coordination and supervision to provide removal of the double door as noted on Sheet A0101B, Door into future Training Room 109.

B. Additive bid item 02

1. Base Bid Glass Door: 0.00 dollars as not work would be involved

2. Glass Door: State the amount to be added to the Base Bid for providing all work including labor, materials, coordination and supervision to provide a new 3’-0 frameless glass door, 1/2 inch tempered glass door where double doors were removed at future Training Room.

a. Hardware: Manufacturer’s standard, as approved by Architect.

C. Additive bid item 03

1. Base Bid Finishes MARC Training: 0.00 dollars as not work would be involved

2. Finishes MARC Training: State the amount to be added to the Base Bid for providing all work including labor, materials, coordination and supervision to provide removal of base and carpet and installation of new base (B1) and carpet (C1) in MARC Training area Room 105.

D. Additive bid item 04

1. Base Bid Finishes Training Room: 0.00 dollars as not work would be involved

2. Finishes Training Room: State the amount to be added to the Base Bid for providing all work including labor, materials, coordination and supervision to provide removal of base and carpet and installation of new base (B1) and carpet (C1) in Training Room 109.

END OF SECTION 01 2301

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including:

1. Contractor's Construction Schedule
2. Submittal Schedule
3. Daily Construction Reports
4. Shop Drawings
5. Product Data
6. Samples

B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits
2. Applications for Payment
3. Performance and Payment Bonds
4. Insurance Certificates
5. List of Subcontractors with start and finish dates (update as necessary)
6. Schedule of Values
7. Construction Schedule

C. The Schedule of Values submittal is included in Section 01027 Applications for Payment.

D. Inspection and test reports are included in Section 01400 Quality Control Services.

1.03 SUBMITTAL PROCEDURES

A. Review, stamp and approve each submittal prior to transmitting to Architect. Without such stamp and signature, submittal will be returned NOT REVIEWED.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

    a. The Project Manager reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

    a. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Project Manager will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. Allow two weeks for reprocessing each submittal.
    d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

B. Electronic Submittal Administrative Requirements

1. Identify and incorporate information in each electronic submittal file as follows:

    a. Assemble complete submittal package into a single indexed and bookmarked file with links enabling navigation to each item.
    b. Scanned using 300 dpi resolution
    c. Name file with submittal number identifier described in Part 1 Article – Submittal Procedures
    d. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by all reviewers.
    e. Samples will require a physical delivery with transmittal. Sample approval may be electronic, depending on submittal requirements of that section.

2. Post electronic submittals as PDF electronic files directly to designated FTP site specifically established for Project. Notify Architect via email when shop drawing files have been posted.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
    b. Provide electronic submittals for:

        1) Product Data
        2) Shop Drawings
        3) Project Schedule
        4) Sustainable Construction Program Submittals
        5) Delegated Design Services

c. Required Number of Submittals:

1) Submit one CD with Shop Drawings
2) Scan all pages of submittal to .pdf format and submit on a CD
3) Distribution: 1 CD will returned for printing and distribution

3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically-submitted certificates

D. Contractor shall be responsible for cost of re-review of rejected submittals. Costs for re-review shall be reimbursed to the County by deducting the cost from the Contractors monthly progress payments. Costs to be determined by applying the consultant's standard billing rates, plus 10% handling by the County.

E. Substitution request to specified products will be made within 30 days of Notice to Proceed. After the 30 day period, no requests for substitutions from the Contractor will be considered.

1. Substitution submitted within the first 30 days will have product data from specified and requested substitute submitted together and demonstrate better quality, cost savings if of equal quality, or show benefit to the County for excepting the substitute.

F. Once submittals are approved or approved as noted, they will be scanned and converted to PDF documents with OCR (optical character recognition) and given to the owner.

1.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (LINEAR BAR CHART SCHEDULE)

A. Linear bar chart time control schedule

1. Work overtime, nights, and weekends, as necessary to maintain schedule.
2. Overtime, night, and weekend work will be at no additional cost to the Owner.
3. Expedite approvals and deliveries of material so as not to delay job progress.

B. Contract Modifications: For each proposed contract modification and concurrent with its submission, demonstrate the effect of the proposed change on the project schedule.

C. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in start dates.
3. Changes in finish dates.
4. Changes in the Contract Time.

1.05 SUBMITTAL LOG

A. After development and acceptance of the Contractor's construction schedule, prepare a complete log of submittals.

1. Coordinate submittals log with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.

2. Prepare the log in chronological order; include all submittals required. Provide the following information:

a. Scheduled date for the first submittal
b. Related Section number
c. Submittal category
d. Name of subcontractor
e. Description of the part of the work covered
f. Scheduled date for resubmittal
g. Scheduled date the Architect's final release or approval.

3. All submittals must be received within the first 25% of contract time.

B. Distribution: Following response to initial submittal, print and distribute copies to the Project Manager, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

1. When revision are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

C. Log Updating: Revise the log after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.06 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Project Manager at weekly intervals:

1. List of subcontractors at the site
2. Approximate count of personnel at the site
3. High and low temperatures, general weather conditions
4. Accidents and unusual events
5. Meetings and significant decisions
6. Stoppages, delays, shortages, losses
7. Meter readings and similar recordings
8. Emergency procedures
9. Orders and requests of governing authorities
10. Change Orders received, implemented

11. Services connected, disconnected
12. Equipment or system tests and start-ups
13. Partial completions, occupancies
14. Substantial Completions authorized

1.07 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered a Shop Drawings and will be rejected.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:

1. All required dimensions
2. Identification of products and materials included
3. Compliance with specified standards
4. Notation of coordination requirements
5. Notation of dimensions established by field measurement
6. Sheet Size: Except for templates, patterns and similar full-size Drawings on sheets at least 8 1/2" x 11" but no larger than 24" x 36".
7. Initial Submittal: Submit one correctable translucent reproducible print and one blue-or black-line print for the Project Manager's review; the reproducible print will be returned.
8. Initial Submittal: Submit 2 blue-or black-line prints for the Architect's review; one will be returned.
9. Final Submittal: Submit 5 blue-or black-line prints; submit 7 prints where required for maintenance manuals. 3 prints will be retained; the remainder will be returned.
10. Final Submittal: Submit 3 blue-or black-line prints; submit 5 prints where required for maintenance manuals. 2 prints will be retained; the remainder will be returned.
    a. One of the prints returned shall be marked-up and maintained as a Record Documents.
11. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connections with construction.

C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Preparation of coordination Drawings is specified in section Project Coordination and may include components previously shown in detail on Shop Drawings or Product Data.

2. Contractor is not entitled to additional payments due to lack of compliance with this Section.

1.08 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as a Shop Drawing.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's printed recommendations
b. Compliance with recognized trade association standards
c. Compliance with recognized testing agency standards
d. Application of testing agency labels and seals
e. Notation of dimensions verified by field measurement
f. Notation of coordination requirements
g. Manufacturers local representative and phone number.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.
4. Submittals: Submit six (6) copies of each required submittal. The Project Manager will return two (2) sets to the Contractor marked with action taken and corrections or modifications required.

a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

5. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

a. Do not proceed with installation until an applicable copy of Product Data applicable is in the Installer's possession.
b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.09 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's/Owner's Sample. Include the following:

    a. Generic description of the Sample
    b Sample source
    c. Product name or name of manufacturer
    d. Compliance with recognized standards
    e. Availability and delivery time

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

    a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

    b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.

3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

    a. Preliminary submittals will be reviewed and returned with the Architect’s/Owner’s mark indicating selection and other action.

4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit 3 sets; one will be returned marked with the action taken.

5. Maintain sets of Samples, as returned, at the project site, for quality comparisons throughout the course of construction.

    a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
    b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field Samples specified in individual sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work

will be judged.

a. Comply with submittal requirements. Process transmittal forms to provide a record of activity.

1.10 ARCHITECT'S ACTION

A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect/Project Manager will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, similarly as follows, to indicate the action taken:

1. Final Unrestricted Release: Work may proceed, provided it complies with contract documents, when submittal is returned with the following: "No Exceptions Taken"
2. Final-But Restricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with contract documents, when submittal is returned with the following: "Note Comments"
3. Returned for Resubmittal: Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking. Do not allow submittals with the following marking (or unmarked submittals where a marking is required) to be used in connection with performance of the work: "Resubmit"

a. Do not permit submittals marked 'Revise and Resubmit' to be used at the Project site, or elsewhere where work is in progress.

4. Rejected: Submittal does not comply with requirements of the Contract Documents. Submittal must be discarded and entirely new submittal shall be forward to the Project Manager without delay: "Rejected"

PART 2 PRODUCTS

(Not Applicable)

PART 3 Execution

(Not Applicable)

END OF SECTION 01300

SECTION 01 3233
PRE-CONSTRUCTION VIDEO RECORDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes construction video recordings.

1.2 SUBMITTALS

A. Two standard size DVD videos in Microsoft viewer format of the entire Site prior to the commencement of any work.

1.3 QUALITY ASSURANCE

A. Video Recordings:

1. Format in latest release of Windows Media Player.
2. Record the DVD prior to the commencement of any work.
3. Architect shall review DVD prior to the commencement of construction activity.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION VIDEOS

A. Before starting Work, take videos of the site and surrounding properties from different points of view as selected by the Architect and Owner's Representative. Record pre-existing conditions of the building, site, and abutting properties obtained from several perspectives. Provide narrative describing the vantage point and area being photographed.

B. Video in sufficient length and detail to show the following:

1. All locations at the areas where the Owner will occupied the building and where the construction limits have been established.
2. Path to Work area from staging area/parking lot.
3. All existing roofing areas

C. The architect reserves the right to request additional videos for the duration of the Project.

END OF SECTION 01 3233

SECTION 01380
CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Contractual Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. General: This Section specifies administrative and procedural requirements for construction photographs.

B. See Section 013233 for preconstruction video documentation

1.03 SUBMITTALS

A. Photographs: Submit actual RAW images

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PHOTOGRAPHIC REQUIREMENTS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
2. Date and Time: Include date and time in file name for each image.

C. Periodic Construction Photographs: Subject to Owner approval, take twelve color photographs monthly, coinciding with cut-off date associated with each Application for Payment. Select interior vantage points to best show status of construction and progress since last photographs were taken.

1. Subject to Owner approval, take photographs for each submittal from the same viewpoint unless specifically directed otherwise by Architect.

D. Final Completion Construction Photographs: Subject to Owner approval, take twelve color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

END OF SECTION 01380

SECTION 01400
QUALITY CONTROL SERVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division -1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and test, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspection, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitates compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.03 GENERAL QUALITY CONTROL

A. The Contractor shall be responsible for maintaining and ensuring quality control over subcontractors, suppliers, manufacturers, materials, equipment, products, services, site conditions and workmanship to product work of specified quality. The completed work shall be of high quality throughout.

1.04 WORKMANSHIP

A. Comply with well-known standards recognized be each trade except when more

restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality. Said qualifications shall be determined by well-known standards recognized by the trade for each respective portion of contract work.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration and racking.

1.05 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.06 MANUFACTURER'S CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate and supporting documentation, in duplicate, that products meet or exceed specified requirements.

B. ASBESTOS FREE MATERIALS - Manufacturer and/or supplier shall provide a written and notarized statement on manufacturer's company letterhead to certify and warrant that product (s) utilized on project are asbestos free.

1.07 MOCKUPS

A. When required by individual Specifications Section, erect complete, full scale mockup of assembly at Project Site.

1.08 MANUFACTURER'S FIELD SERVICES

A. When specified in respective Specification Sections, require supplier and/or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, test, adjust and balance of equipment as applicable and to make appropriate recommendations.

B. Representative shall submit written report to Owner listing observations, recommendations, and certifying full conformance and compliance with manufacturers standards or requirements.

1.09 TESTING LABORATORY SERVICES

A. The County shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests for construction materials (soils, concrete) and threshold inspections.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. Reports will be submitted to the County, Contractor and Architect giving observations and results of tests, indicating compliance or noncompliance with specified standards and with Contract Documents.

D. Contractor shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design, mix equipment, storage and assistance as requested.

1. The contractor shall be responsible for notifying the testing laboratory at least 24 hours prior to expected time for operations requiring testing services. Longer length of notice to testing laboratory shall be provided by Contractor when required by the testing laboratory to ensure the timely scheduling and performance of all tests required.

2. The Contractor is responsible for obtaining and paying tests including but not limited to test and balance, portable water bacteriological tests and test required in individual sections throughout the Project Manual.

E. The costs of any tests which fail will be paid for by the Contractor. The amount to be reimbursed to the County by the Contractor, will be the amount invoiced to the County by the testing laboratory in accordance with the testing services fees set forth in its contract with the County.

1.10 TEMPERATURE/HUMIDITY LOG

A. The Contractor shall be responsible for preparing rain, temperature and humidity measuring devices at the project site and maintaining a log of temperature and humidity measurements.

B. Said log shall contain a daily record of exterior temperature, rainfall amount and humidity conditions and where environmental conditions are specified in individual sections, a daily record of the temperature and humidity conditions where the work of those sections is stored and installed.

C. The Temperature/Humidity Log shall be available to the Project Manager as part of the Contract Documents.

1.11 RESPONSIBILITIES

A. The Owner shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and these services include those specified to be performed by an independent agency and not by the Contractor.

B. The Contractor shall cover all costs of tests or inspections to evaluate means and methods of installation performed as a substitution and not as originally specified.

1. Re-testing: The Contractor is responsible for re-testing where results of required inspections, test or similar services prove unsatisfactory and do not indicate compliance with Contract Documents requirements, regardless of whether the original test was the Contractor’s responsibility.

a. Cost of re-testing construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

2. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to:

a. Providing access to the work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
b. Taking adequate quantities of representatives samples of materials that require testing or assisting the agency in taking samples.
c. Providing facilities for storage and curing the test samples.
d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
e. Security and protection of samples and test equipment at the Project site.

C. Duties of the Testing Agency: The independent testing agency engages to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

D. Coordination: The Contractor and each agency engaged to perform inspection, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.12 SUBMITTALS

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are pre-qualified as complying with Recommended Requirements for Independent Laboratory qualification by the

American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engages on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finished to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for Cutting and Patching.

B. Protect construction exposed by or for quality control service activities, and protects and repaired construction.

C. Repair and protection is the Contractor's responsibility regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selection and payment

B. Contractor Submittals

C. Laboratory responsibilities

D. Laboratory reports

E. Limits on testing laboratory authority

F. Contractor responsibilities

G. Schedule of inspections and tests

1.02 REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engages in testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

1.03 SELECTION AND PAYMENT

A. Owner will employ and pay for services of an independent testing laboratory to perform specified inspection and testing.

B. Employment of testing laboratory shall in no way relieve Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.04 QUALITY ASSURANCE

A. Comply with requirements of ANSI/ASTM E329 and ANSI/ASTM D3740

B. Laboratory: Authorized to operate in state in which Project is located.

C. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards (NBS) Standards or accepted values of natural physical constants.

1.05 LABORATORY RESPONSIBILITIES

A. Test samples of mixes

B. Provide qualified personnel at site when required. Cooperate with Orange County and Contractor in performance of services.

C. Perform specified inspection, sampling, and testing of Products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Orange County and Contractor of observed irregularities or non-conformance of Work or Products.

F. Perform additional inspections and test required by Orange County.

G. Attend preconstruction conferences and progress meetings.

1.06 LABORATORY REPORTS

A. After each inspection and test, promptly submit four copies of laboratory report to Orange County, and to Contractor.

B. Include:

1. Date issued
2. Project title and number
3. Name of inspector
4. Data and time of sampling or inspection
5. Identification of product and Specifications Section
6. Location in the Project
7. Type of inspection or test
8. Date of test
9. Results of tests
10. Conformance with Contract Documents

C. When requested by Orange County, provide interpretation of test results.

1.07 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the work.

C. Laboratory may not assume any duties of Contractor

D. Laboratory has no authority to stop the work.

1.08 CONTRACTOR RESPONSIBILITIES

A. Cooperate with laboratory personnel, and provide access to the work.

B. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.

C. Notify Orange County and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

D. Arrange with laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.

1.09 SCHEDULE OF INSPECTIONS AND TESTS

A. Testing required:

1. Provide concrete mix designs.

2. Strength test for each 50 cubic yard of concrete placed.

END OF SECTION 01410

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01300 -Submittals.

C. Administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01631 ‘Product Substitution’.

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents such as ‘specialties’, ‘systems’, ‘structure’, ‘finishes’, ‘accessories’, and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. ‘Products’ are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term ‘product’ includes the term ‘material’, ‘equipment’, ‘system’ and terms of similar intent.

    a. ‘Named Products’ are items identified by manufacturer’s product name, including make or model designation, indicated in the manufacturer’s published product literature, that is current as of the date of the Contract Documents.
    b. ‘Foreign Products’, as distinguished from ‘domestic products’, are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens nor living within the United States and its possessions.

2. ‘Materials’ are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the work.

3. ‘Equipment’ is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or

piping.

1.04 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.

a. Name of product and manufacturer
b. Model and serial number
c. Capacity
d. Speed
e. Ratings
f. Additional pertinent information

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deteriorating and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

3. Deliver products to the site in the manufacturer's original sealed container of other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate in prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situation on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.

a. Where products or manufacturers are specified by name, accompanied by the term 'or equal' or 'or approved equal' comply with the Contractor Document provisions concerning 'substitutions' to obtain approval for use of an unnamed product.

2. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of those products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning 'substitutions' to obtain approval for use of an unnamed product.

3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated.

   a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

   a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning 'substitutions' for selection of a matching product in another product category, or for noncompliance with specified requirements.

7. Visual Selection: Where specified product requirements include the phrase A... as selected from manufacturer's standard colors, pattern, textures... or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

8. Asbestos free materials: No products containing asbestos shall be used for any part of the work for this product. Provide verification.

PART 3 EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each project securely in place, accurately located and aligned with other work.

   1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01631
PRODUCTS SUBSTITUTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for handling request for substitutions.

B. The Contractor's Installation Schedule and the Schedule of Submittals are included under Section Submittals.

C. Standards: Refer to Section 01095 Reference Standards and Definitions for applicability of industry standards to products specified.

D. Procedural requirements governing the Contractor's selection of products and product options are included under Section Materials and Equipment.

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment, and methods of installation required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for substitutions. The following are not considered substitutions:

1. Only substitutions requested by Contractor are considered as included in the Contract Documents and are not subject to requirements specified in Section for substitutions.

2. Revisions to Contract Documents requested by the Owner or Architect.

3. Specified options of products and installation methods included in Contract Documents.

4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.04 SUBMITTALS

A. Substitution Request Submittal: Request for substitution will be considered if received within thirty (30) days after commencement of the Work, as long as this

time allowance will not impact the construction schedule,

1. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitution, and the following information, as appropriate:
   a. Product Data, including Drawings, and descriptions of products, fabrication and installation procedures.
   b. Samples, where applicable or requested.
   c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
   d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractor's, that will become necessary to accommodate the proposed substitution.
   e. A statement indicating the substitution's effect on the Contractor's construction schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
   f. Cost information, including a proposal of the net change, if any in the Contract Sum.
   g. Certification by the Contractor that the Substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

3. Architects Action: Within two weeks of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request if needed. Within two (2) weeks of receipt of the request, or one week of receipt of the additional information or documentation, which ever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the project specified by name. Decision on the use of a product substitution or its rejection by the Architect is considered final. Acceptance will be in the form of a Change Order.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise request will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.

5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

6. A substantial advantage is offered to the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar consideration.

7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

B. The Contractor's submittal and Project Manager's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

C. Substitution request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.

2. Will provide the same warranty for substitution as for specified product.

3. Will coordinate installation and make other changes which may be required for work to be complete in all respects.

4. Waives claims for additional costs which may subsequently become apparent. All costs associated with the substitution will be paid by the Contractor regardless of approvals given, and regardless of subsequent difficulties experienced as a result of substitutions.

END OF SECTION 01631

SECTION 01700
PROJECT CLOSE-OUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements for project close-out, including but not limited to:

1. Inspection procedures
2. Project record document submittal. (Substantial Completion requirements)
3. Operating and Maintenance Manual Submittal (Substantial Completion requirements).
4. Submittal of warranties (Substantial Completion requirement).
5. Final cleaning including restroom cleaning

B. Close-out requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 49.

C. Final Payment to be made when the County has received all required close-out documents.

1.03 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following: List exceptions in the request.

1. In the Application for Payment that coincided with, or first follows, the date Substantial Completion in claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

    a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.

2. Advise Owner of pending insurance change-over requirements.

3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating

certificates and similar releases.

5. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Project Manager will either proceed with inspection or advise the Contractor of unfilled requirements. The Project Manager will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. Results of the completed inspection will form the basis of requirements for final acceptance.

2. Should the project fail to meet the standards required for Substantial Completion as defined in the documents, the Contractor will pay the expense of a second inspection by the Architect/Consultants and the Owner. Cost will be deducted from the Contractor's retainage.

1.04 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following list exceptions in the request:

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and complete operations where required.

2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

3. Submit a certified copy of the Architect or Owner's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Project Manager.

4. Submit final meter readings for utilities, a measured record of stored fuel and similar data as of the date of Substantial Completion, or when the Owner took possession of the responsibility for corresponding elements of the Work.

5. Submit consent of surety to final payment.

6. Submit a final liquidated damages settlement statement

7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Architect will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of

circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certification of final acceptance, or advise the contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.05 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposed; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation; where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Provide for project photographs if deemed necessary by Owner's representative.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.

2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

3. Note related Change Order numbers where applicable.

4. Organize record drawing sheets, and print. suitable titles, dates and other identification on the cover of each set.

5. Provide three (3) additional sets of black line drawing sets of As-Builts Drawings.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Project Data.

1. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Project Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variation in actual work performed in comparison with information submitted. Include variations in products delivered to

the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data in the three ring binder (indexed) to the Architect for the Owners records.

E. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect and the Owners personnel to determine which of the submitted Samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owners Sample storage area.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous record and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Project Manager for the Owner's records.

G. Maintenance Manuals: Organize operating and maintenance data into five (5) suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions
2. Spare parts list
3. Copies of warranties
4. Wiring diagrams
5. Recommended turn-around cycles
6. Inspection procedures
7. Shop Drawings and Product Data
8. Fixture lamping schedule

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 CLOSE-OUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that required regular maintenance. If installers are not experienced in procedures, provide instruction by manufacturer’s representatives. All items to be provided or competed prior to Certificate of Substantial Completion being issued by the Owner. Include a detailed review of the following items:

1. Maintenance manuals
2. Record documents

3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels
7. Identification systems
8. Control sequences
9. Hazards
10. Cleaning
11. Warranties and bonds
12. Maintenance agreements and similar continuing commitments
13. On site instructions to County maintenance personnel on major systems operations such as HVAC as per technical specifications.

B. As part of instruction for operating equipment, demonstrate the following procedures, prior to the Owner issuing Certificate of Substantial Completion:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments

3.02 PROJECT CLOSE-OUT MANUALS AT SUBSTANTIAL COMPLETION

A. Submit Project Close-out Manuals prior to issuance of final application for payment. Provide three (3) copies.

B. Bind in commercial quality 8.5 x 11" three ring binder, indexed with hardback, cleanable, plastic covers.

C. Label cover of each binder with typed title PROJECT CLOSE-OUT MANUAL, with title of project; name, address, and telephone number of Contractor and name of responsible Principal.

D. Provide table of contents: Neatly typed, in the following sequence:

1. Final Certificate of Occupancy
2. Warranty Service Subcontractors Identification List
3. Final Lien Waivers and Releases
4. Warranties and Guarantees
5. Systems Operations and Maintenance Instruction
6. Manufacturer’s Certificates and Certifications
7. Maintenance Service Contracts
8. Spare Parts Inventory List
9. Special Systems Operating Permits or Approvals
10. Asbestos free materials notarized statement

E. Provide all documents for each section listed. List individual documents in each section in the Table of Contents, in the sequence of the Table of Contents of the

Project Manual.

F. Identify each document listed in the Table of Contents with the number and title of the specification section in which specified, and the name of the product or work item.

G. Separate each section with index to sheets that are keyed to the Table of Contents listing.

H. Warranty Service Subcontractors List shall identify subcontractor supplier, and manufacturer for each warranty with name, address and emergency telephone number.

I. Electronic Close-out DVD: At the completion of the project, submit one copy of a DVD with entire project close out information below in PDF format. All letter, legal and brochure size sheets shall be portrait and the As-build drawings will be landscape. All fonts will be Arial. All items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify words on the scanned documents.

1. Contacts: Set up a separate PDF for the contacts. No bookmarks are needed for this section.
2. As-Builts: All as-built drawings will be landscape.
3. Submittals: All technical submittal items (approved and approved as noted) will be provided and sorted by the 16 standard divisions. Bookmarks will be needed for the appropriate divisions.
4. Operations and Maintenance Manual: Specify the division name only in the bookmarks (1-16). Please note that all items will be in PDF with OCR (Optical Character Recognition). This will enable a search engine to identify works on the scanned documents.
5. Permitting: This should include the Certificate of Occupancy and any other document that the Project Manager may include pertaining to the permitting for the project.

3.03 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section - Temporary Facilities.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are

noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

c. Clean exposed exterior and interior hard-surfaced finished to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface. Remove waste and surplus materials from the site in an appropriate manner.

C. Pest Control: Engage an experienced exterminator to make a final inspection, and rid the Project of rodents, insects and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

F. Employ services of a janitorial service to clean all toilet fixtures and spaces to a sanitary condition, including stains from water exposure.

1. Clean restrooms that are made available for the contractors use, weekly, to a sanitary condition.

END OF SECTION 01700

SECTION 01740
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contractor Documents, including manufacturer's standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractors special warranty of workmanship and materials.

2. General close-out requirements are included in Section 01700 Project Close-Out.

3. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual Sections of Division 2 through 49.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturers' disclaimers and limitations on product warranties to not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.03 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of Warranty. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents.

D. Owners Recourse: Written warranties made to the Owner are in addition to implied

warranties, and shall not limit the duties, obligation, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligation, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept work for the Project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 WARRANTY PERIOD

A. The Contractor shall participate with the County and the Architects' representative, at the beginning of the tenth month of the warranty period, in conducting an on site review and evaluation of all items of equipment, materials and workmanship covered by the warranties and guarantees. Contractor shall act promptly and without cost to the County to correct all defects, problems, or deficiencies determined as such by the Architect/Owner during on the site review.

B. All warranties and guarantees shall commence on the date of Final Completion except for items which are determined by the County to be incomplete or a non-comply status at the time of Final Completion. The coverage commencement date for warranties and guarantees of such work shall be the date of the County's acceptance of that work.

C. Warranty period shall be manufacturers standard for product specified except where specific warranty periods are specified in individual sections. But in no case less than one year.

1.05 SUBMITTALS

A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. If the Architect's Certificate of substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the work, submit written warranties upon request of the Project Manager.

1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Project Manager within fifteen days of completion of that designated portion of the work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepared a written document that contains appropriate terms and identification, ready for executing by the required parties. Submit a draft to the Architect for approval prior to final

execution.

1. Refer to individual Sections of Division 2 through 49 for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind (3) three sets of warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8 ½ by 11" paper.

1. Provide heavy paper dividers with Celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title “WARRANTIES AND BONDS”, the Project title or name, and the name of the Contractor.

3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01740

SECTION 02 4113
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for removing selective portions of the building to accommodate new construction

1. Remodeling construction work and patching are included within the respective sections of specifications, including removal of materials for reuse and incorporation into remodeling or new construction.
2. Relocation of pipes, conduits, ducts, and other mechanical and electrical work is specified in the Facilities Service Subgroup.

1.2 SUBMITTALS

A. Submit digital photographs in JPEG format of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Architect prior to start of work. This is in addition to the requirements for the pre-construction video recordings and periodic construction photos.

1.3 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.4 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Owner assumes no responsibility for actual condition of items or structures to be demolished.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site

as they are removed.

1. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Do not interrupt utilities serving occupied facilities, except when authorized in writing by Owner. Provide temporary services during interruptions to existing utilities, as acceptable to Owner.
2. Maintain fire-protection facilities in service during selective demolition operations.

G. Environmental Controls: Use temporary enclosures, return air flters, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Cover and protect equipment that have not been removed.

3.4 DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work

within limitations of governing regulations and as follows:

1. Cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches without specific written permission from the Owner.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.
6. Remove wall and floor tile where demolition work has been performed. Areas such as locations where existing partitions and toilet accessories have been removed. Do not damage any waterproofing membranes.
7. Remove gypsum wall board from walls and soffits where damaged by demolition activities. Remove enough to make patching acceptable.
8. Remove GWB at locations where new blocking is required for new accessories and other items attached to the walls.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

C. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architect, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Site and legally dispose in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by

selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 4113

SECTION 03 5414
CEMENT BASED UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cement-based, polymer-modified, self-leveling underlayment for interior finish flooring where demolition has resulted in an unacceptable surface texture or level.

B. Material shall be compatible with the designated fire rated assembly.

1.2 SUBMITTALS

A. Product Data: Laboratory test reports, mix designs and materials certificates as specified in Division 03 Section, Cast-In-Place Concrete.

1. Manufacturer's product data for cement, floor primer and overspray.
2. Show primer is compatible with intended substrate.

B. Shop Drawings: Plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

C. Mock-Up

1.3 QUALITY ASSURANCE

A. Verify compatibility of cement-based underlayment including surface sealers, if any, with indicated finish flooring products, including adhesives.

B. Mockups: Apply underlayment mockups to demonstrate surface finish, bonding, texture, tolerances, and standard of workmanship.

1. Apply mockups approximately 100 square feet in area directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 FIELD QUALITY CONTROL

A. Slump Test: Test mix for slump during pumping using a 2 inch by 4 inch cylinder resulting in a patty size of 8 inches plus or minus 1 inch diameter.

B. Field Samples: At least one set of 3 molded cube samples shall be taken from each day's pour during the application. Cubes shall be tested in accordance with ASTM C472. Make test results available to architect and contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages, protected from exposure to the elements.

B. Remove damaged or deteriorated materials from the Site.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

1. Place underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.7 COORDINATION

A. Coordinate application of underlayment with requirements of floor covering products, including adhesives to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 CEMENT-BASED UNDERLAYMENT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Ardex, Inc.; K-15 Self-Leveling Underlayment Concrete.
2. Burke Group, LLC (The); 300 Premium Underlayment.
3. Others meeting the following requirements and approved by Architect

B. Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in uniform thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
2. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.

C. Accessory Materials:

1. Primers and Aggregates: Recommended in writing by manufacturer for substrate, thickness, and conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for conditions affecting performance. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Prepare and clean substrates. Provide clean, dry, neutral-pH substrate for underlayment application.

1. Treat nonmoving substrate cracks to prevent cracks from telegraphing (reflecting) through underlayment.
2. Concrete Substrates: Mechanically remove laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
3. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.
4. Metal Substrates: Mechanically remove, according to manufacturer's written instructions, rust, foreign matter, and other contaminants that might impair underlayment bond. Apply corrosion-resistant coating compatible with underlayment if recommended in writing by underlayment

manufacturer.

5. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.

B. After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

C. Coordinate application of components, including primer, to provide optimum underlayment-to-substrate and intercoat adhesion.

D. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

E. Apply underlayment to produce uniform, level surface.

1. Apply first level, with recommended gravel aggregate, to 1/2 to 1 inch below intended rinal elevation,
2. Apply a final layer without aggregate to produce smooth surface.
3. Feather edges to match adjacent floor elevations.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

G. Do not install finish flooring over underlayment until after time period recommended by underlayment manufacturer.

3.3 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 5414

SECTION 06 0500
COMMON WORK RESULTS FOR WOOD, PLASTICS, AND COMPOSITES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes work results requirements that are common to all other Division 06 Sections.

1.2 SUBMITTALS

A. Product Data:

1. Fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Certification that chemical treatment complies with specification for each type of treatment.

1.3 QUALITY ASSURANCE

A. Kiln dry all wood to the following maximum moisture content: 15 percent

B. Products used within the interior of the building shall contain no added formaldehyde including glues.

1. Emission standards for particleboard, medium density fiberboard, hardwood plywood, and finished goods made with them must meet the EPA's publication "The Formaldehyde Emission Standards for Composite Wood Products Act of 2010"

1.4 PROJECT CONDITIONS

A. Coordinate environmental requirements for casework installation areas. Do not deliver or install casework until temperature and relative humidity have been stabilized and will be maintained.

1. Maintain temperature and humidity in instillation area as required to maintain moisture content of installed casework within a 1.0 percent tolerance through date of Substantial Completion.

B. Coordination: Fit work to other Work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports and reinforcement to allow proper attachment of other work.

PART 2 - PRODUCTS

2.1 FIRE-RETARDANT-TREATMENT

A. Fire-Retardant Particleboard: Panels made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

B. Fire-Retardant Fiberboard: ANSI A208.2 medium-density fiberboard panels made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed

together at time of panel manufacture with flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. Install FT products where indicated and the following:

1. Concealed blocking in rated partitions
2. Plywood backing panels.
3. Other locations detailed on Drawings

2.2 MISCELLANEOUS MATERIALS

A. Adhesives: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

1. Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 APPLICATION

A. Refer to other specific Division 06 Sections

B. Installation of Pressure Treated Wood: No direct contact with untreated steel shall be allowed. Provide coating or sheet barriers to separate treated wood from steel. Apply only stainless steel fasteners into or through copper preservative treated wood.

END OF SECTION 06 0500

SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Wood grounds, nailers, blocking, and sleepers

1.2 REFERENCES

A. Lumber Standard: Comply with PS-20 and with applicable rules of the respective grading and inspecting agencies for species and products indicated.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For pressure treated lumber and plywood, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: SPIB - Southern Pine Inspection Bureau.

C. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.
3. "Standard" grade.
4. Southern Pine graded under SPIB rules.

2.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. No. 2 Boards per SPIB rules.

D. Wood grounds, nailers, and sleepers shall be pressure treated as specified.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Coordinate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Use screws, unless otherwise indicated. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached.

B. Provide fire treated blocking at all locations.

END OF SECTION 06 1000

SECTION 06 2023
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standing and running trim (Wood Base)
2. Shop finishing of woodwork

1.2 SUBMITTALS

A. Samples: 12 inch long section of each milled trim detailed with primer

B. Qualification data for firms and persons specified in the Quality Assurance Article demonstrating capabilities and experience. Include list of completed projects with contact information for Architects and Owners.

C. Quality Certification: Manufacturer's (fabricators) certification stating work complies with quality grade and other requirements specified.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installation by a firm that can demonstrate successful experience in installing finish carpentry items similar in type and quality for this Project.

B. Quality Standard: Comply with the Architectural Woodwork Standard, Latest Edition for grades of interior architectural woodwork, construction, finishes and other requirements.

C. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain measurements and verify dimensions and any shop drawing details as required for accurate fit.

D. Optimum Moisture Content: Kiln-dry woodwork to an average moisture content within 6 to 11 percent or as otherwise recommended by applicable Quality Standards for the regional climatic conditions involved.

1.4 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with manufacturer's and installer's coordinated advice for optimum temperature and humidity conditions during storage and installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Painted Standing and Running Trim: Pre primed MDF in profile indicated on Drawings.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Countersink nails, fill surface flush, and sand where face nailing is unavoidable

B. Adhesives: Comply with Division 06 Section, Common Work Results for Wood, Plastics, and Composites

2.3 FABRICATION

A. Fabricate finish carpentry to dimensions, profiles and details indicated. Ease edges to radius indicated for the following:

1. Lumber less than 1 inch in nominal thickness: 1/16 inch.
2. Lumber 1 inch or more in nominal thickness: 1/8 inch.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Clean substrates of projections and substances detrimental to application.

C. Coordinate work with other trades affected by this installation. Give particular attention to timely furnishing of supporting and attachment steel embedded in concrete and to providing of wood grounds, nailers, and blocking as not to delay progress.

D. Backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 09 Section, Painting.

3.2 INSTALLATION

A. Do not use finish carpentry materials that are unsound, warped, bowed, twisted, improperly finished, or not adequately seasoned.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 8 feet for plumb and level. Install adjoining finish carpentry with 1/16 inch maximum offset for flush installation and 1/8 inch maximum offset for reveal installation.
3. Coordinate finish carpentry with materials and systems that may be in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces.
4. Do not use pieces less than 36 inches long, except where necessary.

C. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane back of casings to provide uniform thickness across joints if required.

1. Install trim after drywall joint finishing operations are completed.

3.3 CLEANING, AND PROTECTION

A. Clean finish carpentry on exposed and semi-exposed surfaces Repair damaged or defective carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace.

END OF SECTION 06 2023

SECTION 07 8100
APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes repair of existing sprayed-on fireproofing materials.

1.2 SUBMITTALS

A. Product data for each sprayed-on fireproofing product indicated.

1. Certification by manufacturers that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
2. Include certification from manufacturer, signed by an officer of the firm, stating that the proposed material is asbestos free; that there are no unacceptable levels of natural occurring asbestos in any of the component materials.

B. Inspection report

C. Provide reports indicating that physical properties of proposed sprayed-on fireproofing products comply with specified requirements based on comprehensive testing of current product formulations according to the following requirements:

1. Testing is performed on sprayed-on fireproofing materials randomly selected from bags bearing the applicable classification marking of UL or another inspecting and testing agency acceptable to authorities having jurisdiction.
2. Testing is performed on specimens of sprayed-on fireproofing materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical in every respect to installed fireproofing.
3. Qualified independent testing agency does testing on laboratory specimens that it witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.

a. Test reports without the above information are not acceptable.

D. Compatibility and Adhesion Test Reports: Test reports for primers and other coatings applied to structural steel.

E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide sprayed-on fireproofing products identical to those used in assemblies tested for the following fire-test-response characteristics, per test method indicated below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify

packages (bags) containing fireproofing with appropriate classification markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: As indicated by reference to fire-resistive designs listed in UL "Fire Resistance Directory," or in the comparable publication of another testing and inspecting agency acceptable to authorities having jurisdiction, for fire-resistive assemblies where sprayed-on fireproofing serves as direct-applied protection, tested per ASTM E 119.
2. Surface-Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84.

B. Installer Qualifications: Engage an experienced Installer certified, licensed, or otherwise qualified by the sprayed-on fireproofing manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its sprayed-on fireproofing products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

C. Compatibility and Adhesion Tests: Test primers and other coatings applied to structural steel from a qualified independent testing agency indicating that primers and coatings proposed for application in shop or field are compatible with sprayed-on fireproofing. Instruct laboratory to determine compatibility as follows:

1. By testing for bond per ASTM E 736 and requirements specified in UL "Fire Resistance Directory" about coating materials.
2. By verifying that fireproofing manufacturer has not found primers or coatings to be incompatible with fireproofing based on its own laboratory testing or field experience.

D. Provide fireproofing products containing no detectable asbestos as determined according to the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

E. Pre-Installation Conference: Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Discard materials whose shelf life has expired.

C. Store materials inside, under cover, above ground, and dry until ready for use. Discard materials that have deteriorated.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg F and falling, unless temporary protection

and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after applying sprayed-on fireproofing.

1.6 SEQUENCING

A. Sequence and coordinate application of fireproofing with other related work to comply with the following requirements:

1. Provide temporary enclosures to prevent deterioration of fireproofing for interior applications due to exposure to unfavorable environmental conditions.
2. Avoid unnecessary exposure of fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Standard Durability:

1. Monokote MK-6 Series by Grace Construction Products
2. AD Southwest Fireproofing Type 5GP by Carboline Company
3. Cafco 300 by Isolatek International
4. Others as approved by Architect that may be required for the existing conditions and warranties.

B. Product shall be a trowelable version of the manufacturers' standard product designed for patching and maintaining the fire rating assembly in kind.

2.2 MATERIAL

A. Factory mixed, portland cement or gypsum blended for uniform texture with mineral aggregates or mineral fibers and additives, without chlorides, conforming to the following requirements.

B. Standard Durability:

1. Bond Strength: 200 psf minimum per ASTM E736.
2. Bond Impact: No cracking, flaking, or delamination per ASTM E760.
3. Dry Density: 15 lbs./cu.ft. minimum per ASTM E605.
4. Compressive Strength: 10 lbf/sq. in. minimum per ASTM E761.
5. Surface Burning Characteristics: Maximum flame spread of 0 and maximum smoke developed of 0 per ASTM E84.

2.3 AUXILIARY MATERIALS

A. Sprayed-On Fireproofing Patching Material: Patching compound shall be as recommended by the sprayed-on fireproofing manufacturer.

B. Provide bonding agents, metal lath, reinforcing fabrics and mesh to comply with UL assembly's requirements.

PART 3 - EXECUTION

3.1 EXAMINATION AND COORDINATION

A. Inspection Report: Examine all spray fireproofing within the Contract Limits. Write up any existing deficiencies and note all damages existing and new as caused by current Work activities.

1. Inspection Report shall include recommended patching procedures for each area noted.
2. Cost to repair existing deficiencies will be negotiated with Owner after report is complete.

B. Examine substrates to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
3. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying the fireproofing.

C. Conduct tests according to sprayed-on fireproofing manufacturer's recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond where there is any doubt as to their presence.

D. Do not proceed with installation of fireproofing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. Beginning of the Work shall constitute acceptance of the surface, and the Contractor shall be held accountable for unsatisfactory results.

C. Cover other Work which might be damaged by fall out or overspray of fireproofing materials during application.

D. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

3.3 APPLICATION

A. Apply in accordance with the printed instructions of the material manufacturer and shall be installed by skilled craftsmen, acceptable to the manufacturer.

B. Patch and repair:

1. Fireproofing damaged by other trades
2. Patch using materials in kind

3. Work that has not been successfully protected, existing and new
4. Areas found deficient by testing agency
5. Do not patch any area larger than 12 square inches without Architect's written permission

C. Install auxiliary materials as required, according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

3.4 CLEAN-UP

A. Cleaning: Remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing through Date of Substantial Completion.

C. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and reapply at areas where fireproofing was removed or damaged.

END OF SECTION 07 8100

SECTION 07 8400
FIRESTOPPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes firestopping and smokesealing for the following:

1. Openings of, and annular spaces of penetrations in walls, ceilings, and floors (including floor penetrations occurring within walls)
2. Membrane-penetrations of fire-resistance rated construction including both empty openings and openings containing cables, pipes, ducts, conduits, structural members, and other penetrating items
3. Construction, control, expansion, and sealant joints in walls, ceilings, floors, and compartmentalized areas
4. Head of walls abutting the underside of structural floor and roof decks, and at the perimeter of walls abutting construction
5. Openings of, and annular spaces of, through- and membrane-penetrations in smoke barriers and other compartmentalized areas

B. Section also includes inspection and repair of existing firestop and smokeseal assemblies

1.2 REFERENCES

A. American Society for Testing and Materials International (ASTM)

1. ASTM C719: Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)
2. ASTM C920: Standard Specification for Elastomeric Joint Sealants
3. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials
4. ASTM E119: Standard Test Method for Fire Tests of Building Construction and Materials (UL 263)
5. ASTM E136: Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
6. ASTM E814: Standard Test Method for Fire Tests of Through-Penetration Fire Stops (UL 1479)
7. ASTM E1966: Test Method for Fire-Resistive Joint Systems
8. ASTM E2174: On-Site Inspection of Installed Fire Stops
9. ASTM E2307: Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
10. ASTM E2393: On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

B. Firestop Contractors International Association (FCIA)

1. MOP – FCIA Firestop Manual of Practice

C. Florida Building Code

D. FM Global (Formerly: FM - Factory Mutual System)

1. FM 4991: Approval Standard of Firestop Contractors

E. Underwriters Laboratory, Inc. (UL)

1. UL 2079: Standard for Tests for Fire Resistance of Building Joint Systems

1.3 DEFINITIONS

A. Annular Space: Distance between a penetrating item and the surrounding opening.

B. Firestopping: Materials utilized for contiguous integrity of a rated assembly.

C. Intumescent: Materials which expand significantly when exposed to heat.

D. Joint: The abutment of or gap between two or more assemblies creating a linear breach in the assembly(ies). Gaps may be parallel or perpendicular and can be any combination of smokeseals and fire stops.

E. Membrane-Penetration: An item passing into or exiting from only one side of a rated assembly.

F. Smokesealing: Materials utilized for contiguous integrity of a smoke barrier system.

G. Through-Penetration: An item passing entirely through any rated or designated smoke assembly.

1.4 PERFORMANCE REQUIREMENTS

A. Firestop and smokeseal systems shall resist the spread of fire, resist passage of smoke and other gases, and maintain fire-resistance rating of assembly penetrated. Maintain original fire-resistance rating of assembly being renovated.

1. Provide materials and workmanship conforming to applicable governmental and code requirements for fire rated and smoke barrier assemblies.

B. Testing Requirements:

1. Materials for use as both firestops and smokeseals have been tested by testing agency, and have both F (flame) and T (temperature) ratings determined through ASTM E814, ASTM E119 or UL 2079 as appropriate
2. Testing agency shall be an independent nationally recognized body to assure acceptance of test reports by local agency(ies).

C. Materials in place shall be of sufficient thickness width, density, and construction to provide both F and T rating of at least one hour and whose F rating is not less that the scheduled rating of the assembly. T rated assemblies are required at the following locations:

1. Penetrations located in construction containing fire-protection-rated openings.
2. Penetrating items larger than 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Provide products that do not deteriorate when exposed to view, traffic, moisture, and physical damage.

1. Provide moisture-resistant penetration firestop systems for piping penetrations for plumbing and wet-pipe sprinkler systems
2. Provide firestop systems capable of supporting floor loads involved for floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, either by installing floor plates or by other means
3. Provide penetration firestop systems not requiring removal of insulation for penetrations involving insulated piping
4. Provide products that will remain flexible to allow for movement without affecting the integrity of the system when exposed to movement for systems subject to movement
5. Provide non-intumescent type products for items subject to binding, i.e., fire or smoke dampers

E. Joint Firestop Systems: Provide joint firestop systems with fire-resistance ratings determined per UL 2079, Class I, not less than that of the construction in which the joint occurs.

1. Where movement is required or can be anticipated, joint firestopping system must be listed as a dynamic joint, with movement capabilities equal to those of the in-service conditions.

F. For firestopping exposed to view, provide products with flame spread values less than 25, and smoke-developed values of less than 450 per ASTM E84.

G. Materials offered for horizontal applications shall be capable of self-supporting any penetrating item and shall maintain their integrity when tested in horizontal applications.

H. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide joint systems with assembly ratings equaling or exceeding the fire-resistance ratings of the construction that they join, and with movement capabilities indicated as determined by ASTM E1966.

I. Where there is no specific third party tested and listed, classified firestop system available for a particular firestop configuration, obtain from the firestop manufacturer, an Engineering Judgment or Equivalent Fire Resistance Rated assembly for submittal, acceptable to the AHJ.

1.5 SUBMITTALS

A. Product Data:

1. Manufacturer’s specifications for each material proposed to be installed. Cross reference fire stop and smokeseals binder.
2. Indicate product characteristics, typical uses, approved orientations and methods of installations, performance and limitation criteria, conditions of test and test data
3. Design listings, including illustrations from a qualified testing and inspection agency
4. MSD Sheets: Include SDS as part of closeout documents only
5. Maintenance and repair instructions

a. Include maintenance and inspection requirements that meet the International Fire code, 703.1.

b. Existing Firestop and Smokeseal Systems Report

B. Shop Drawings:

1. Detail materials, anchorage, installation methods, relationships to adjoining construction, type and size of penetrating item, and type and size of joint for each firestop and smokeseal system.
2. Details must be in accordance with scheduled system. Include firestop design designation cross referenced to Firestopping and Smokeseals Binder.
3. Where Project conditions require an engineering judgment, submit illustrations approved by firestopping manufacturer's fire protection engineer with modifications marked. Do not proceed with firestop or smokeseals in area until modifications have been approved.

C. Samples:

1. Provide one sample of each material, keyed to Firestopping and Smokeseals Binder. Samples may be on mock-up.
2. Colors in form of a ribbon of actual cured material of standard colors available

D. Test reports:

1. Test reports shall indicate conformance to ASTM E814 and ASTM E119, including hose stream test
2. Tests to be conducted for both vertical and horizontal conditions, and designate materials as suitable for wall or floor and roof construction respectively
3. Show that products comply with local regulations controlling the use of VOC's and are non-toxic to building occupants
4. Compatibility and adhesion test reports indicating materials forming joint substrates have been tested with fill materials. Include an interpretation of test results and recommendations for primers and substrate preparation

E. Product Certificates:

1. Firestop and smokeseal system products signed by product manufacturer
2. Firestop and smokeseal system products are asbestos free

F. Field Quality-Control Inspection Reports. For firestops and smokeseals installed by Non-FCIA Approved Installer.

1. For firestops and smokeseals installed by Non-FCIA Approved Installer.
2. Special Inspections Reports

G. Installer Qualifications:

1. Firestop Contractors International Association (FCIA) Approved Installer: Copy of FCIA or UL approval.
2. Non-FCIA/UL Approved Installer: Letter from manufacturers of products specified, wherein manufacturer recognizes as trained or approved, or certifies, firm and persons for installation of that manufacturer's products.

H. Firestopping and Smokeseals Binder: After submittal is approved, revise with all comments corrected and included and resubmit copies as follows:

1. Two copies to Architect
2. One copy to Owner's representative
3. One copy to Construction Manager or the General Contractor
4. One copy for job trailer labeled as "Inspector's Copy"
5. One copy for each trade as necessary for the Work

I. Pre-Application Conference: Furnish copy of record discussions to each participant including Architect

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in research, design, fabrication, and production of firestop and smokeseal materials, and carrying product liability insurance coverage for completed installations. Manufacturer to utilize a quality control program accepted by the testing and listing agency.

1. Material packaging shall bear a label from the testing agency

B. Installer Qualifications: A firm that has been qualified by FCIA according to FM Standard 4991, "Approval of Firestop Contractors" or UL Qualified Firestop Program.

1. Installation Responsibility: Assign installation of firestop and smokeseal systems for entire Project to a single qualified installer.

a. All firestop and smokeseal system products, regardless of the Section in which their use is specified or drawing on which their use is indicated, are to be installed by the single qualified installer.

2. As an alternate to utilizing an FCIA Approved installer, Contractor may utilize a non-FCIA approved installer under the following conditions:

a. Field inspection of installed firestop and smokeseal systems is undertaken in accordance with ASTM E2174 "On-Site Inspection of Installed Fire Stops".

b. Non-FCIA Approved Installer Qualifications: A firm experienced in installing firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its firestop and smokeseal system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Provide the following affidavits for non-FCIA approved installers:

1. Provide the following notarized affidavit jointly signed by corporate officers, with titles noted, of both the Contractor and material applicator for each different individual applicator.

"we the undersigned certify that firestops and smokeseals have been installed in accordance with Contract Document

requirements and manufacturer's instructions, and that materials used meet firestopping and smokesealing requirements of the Contract Documents".

2. Provide the following manufacturer's certification, executed by the appropriate person, with title and department noted for each different product manufacturer.

"products provided by (manufacturer) for the (name of project) are composed of the same ingredients and formulation or are of the same components and identical construction as products that have been tested by (the testing agency) for various fire resistive and other performance ratings, and when properly applied or installed in accordance with (manufacturer) instructions will perform in a manner consistent with results obtained in the tests conducted by (the testing agency)".

D. Engineering Judgment: For through or membrane penetrations and assemblies proposed but not yet tested, provide an engineering judgment, signed and sealed by a qualified person and bearing his title. Engineering judgment shall be based on approval tests from a recognized independent testing agency.

1. Provide technical advice from material manufacturer's lab and technical department on materials and assemblies as required. For penetrations, joints and assemblies proposed but not yet tested provide an Engineering Opinion, in writing on manufacturer's letterhead signed by a qualified person and bearing his title, with copies to the Architect. Engineering Opinions shall be based on approval tests from recognized independent testing agency.

E. Source Limitations: Obtain firestop and smokeseal systems, for each kind of construction condition indicated, from a single manufacturer.

1. Completed assemblies shall utilize only materials, components, and orientations utilized in the independent testing agency approval tests. F and T ratings shall be for construction consistent with actual job site conditions.
2. Do not intermix materials from different manufacturers in the same firestop system
3. Tested and listed firestop systems are to be used before any engineering judgments are requested or installed

F. Fire-Test-Response Characteristics: Provide firestop and smokeseal systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestop and smokeseal system tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL, ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Firestop and smokeseal systems are identical to those tested per testing standard referenced in "Performance Requirements" Article. Provide

firestop and smokeseal systems complying with the following requirements:

a. Firestop and smokeseal system products bear classification marking of qualified testing and inspecting agency.
b. Firestop and smokeseal systems correspond to those indicated by reference to system designations listed by the following:

1) UL in its "Fire Resistance Directory".
2) OPL in its "Directory of Listed Building Products, Materials, & Assemblies".
3) ITS in its "Directory of Listed Products".

G. Pre-Application Conference: Prior to preparation for and application of materials to be used as firestops and smokeseals, convene a Pre-Application Conference at the Site with, applicator, affected subcontractor(s), material suppliers, and Architect. Review Contract Document requirements, submittals, Firestopping and Smokeseals Binder, mock-up, status of coordinating work, availability of materials and installation facilities, proposed application schedule, safety and handling requirements, requirements for inspections and testing or certifications, and proposed application procedures and protection requirements. Record discussion.

1. SD Sheets: Issue to the individual responsible for site coordination of SDS information.

H. Field-Constructed Mockup: Prior to installing firestopping and smokesealing, erect mockups for each different system to verify selections made and to demonstrate qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final installations.

1. Build a 4-foot by 8-foot panel of 3-5/8 inch metal studs sheathed with 5/8-inch GWB on each side. Construct a sample of each type of penetration for review prior to any firestop work in Project.
2. Locate mockups on site as directed by Architect.
3. Cross reference mockups to Firestopping and Smokeseals Binder
4. Obtain Architect's and AHJ’s acceptance of mockups before start of final unit of Work.
5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging completed unit of Work.

a. When directed, demolish and remove mockups from Project site.

I. Firestopping and smokeseals shall be free from asbestos, PBC’s, and lead

J. Information in Contract Documents referring to specific design designations of firestop and smokeseal systems is intended to establish requirements of performance based on expected conditions during installation. Changes in conditions and designated system require Architect’s approval.

K. Firestopping and smokesealing materials that have deteriorated or have been damaged due to moisture, temperature change, contaminants, or other causes shall not be used.

1.7 FIRESTOPPING AND SMOKESEALS BINDER

A. Each binder shall be 3-ring, D type, 1-inch minimum with cover and spine label contain the following:

1. Cover Sheet
2. Title Page with name, address, and phone numbers of the general contractor, the installation company, and each installer
3. Installers FCIA Certifications or individual manufacturer's Certifications
4. Product Data (each section tabbed)

    a. Published information sheets
    b. SDS
    c. Certificates of Conformance
    d. Maintenance and repair instructions

5. Warranty information
6. Systems (tabbed per trade and divided into horizontal and vertical installations). The following tabs shall be identified:

    a. Electrical
    b. Plumbing
    c. HVAC
    d. Fire Protection
    e. All Others

7. Any Engineering Judgments or Equivalent Fire Resistance Rated Assemblies

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestop and smokeseal system products to Site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.

B. Store and handle materials for firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install firestop and smokeseal systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturers or when substrates are wet due to rain, condensation, or other causes.

B. Dispose of hazardous firestop and smokeseal materials legally off Site as noted on the individual SDS and per Local and State guidelines.

C. Ventilate firestop systems per manufacturer's written instructions by providing forced-air circulation when required.

D. Do not use any firestop and smokeseal materials that are within 30 days of the shelf life date marked on the package.

1.10 COORDINATION

A. Order of Precedence: Firestopping, smokesealing, acoustical/sound rating, other requirements.

B. Coordinate Work to ensure that pipe, ductwork, conduit, cable, joint size, and other items which penetrate fire rated or smoke barrier construction have been permanently installed and sleeved when necessary, prior to installation of firestops and smokeseals.

C. Schedule and sequence work to assure partitions and other construction which would conceal or enclose penetrations are not erected prior to the installation of firestops and smokeseals.

1. Coordinate installation schedule with local inspecting agency in advance of systems installation.
2. Notify inspecting agency at least seven days in advance of firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover any firestop and smokeseal installations prior to required inspections by building inspector.

E. Coordinate hazardous disposal of firestop materials as noted on individual SDS.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide firestop, smokeseal, and accessory materials with fire resistance rating that are identical to those assemblies whose fire endurance has been determined by testing per ASTM E814 or ASTM E119, by a nationally known testing agency acceptable to the authorities having jurisdiction.

B. Compressive Strength: Capable of self-supporting any penetrative item and maintain the integrity as tested in a horizontal application when offered for a horizontal condition in the Work.

1. Materials shall not cure hard for penetrations or assemblies subject to movement.
2. Materials shall not be water soluble after installation.

C. Compatibility: Provide systems compatible with one another, with the substrates forming openings, and with the items, if any, penetrating systems, under conditions of service and application, as demonstrated by system manufacturer based on testing and field experience.

D. Accessories: Use only components specified by system manufacturer and approved by qualified testing and inspecting agency for systems indicated.

1. Provide forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to produce systems that comply with "Performance Requirements" Article.
2. Primers: As recommended by manufacturer’s for required for various substrates and conditions.

2.2 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANT

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

B. Sealant Colors: Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, and remain in compliance with other requirements of ASTM C920 for uses indicated:

a. 50 percent movement in both extension and compression for a total of 100 percent movement
b. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement

D. Multi-component, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, and remain in compliance with other requirements of ASTM C920 for uses indicated:

a. 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement.
b. 50 percent movement in both extension and compression for a total of 100 percent movement.

E. Single-Component, Non-sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.3 FILL MATERIALS

A. General: Provide firestop and smokeseal systems containing the types of fill materials indicated by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Firestop Devices: Factory-assembled devices sized to fit specific penetrants.

1. Steel pathway and wall plate lined with intumescent material that adjusts automatically to cable additions or subtractions, allowing for 0 to 100-percent visual fill of conductors.

2. Metallic sleeve lined with an intumescent strip, a radial extended flange on one end of the sleeve for fastening to concrete formwork and casting in-place, and a neoprene gasket.

C. Ceramic-Fiber Mastic Coatings and Sealants: Single-component formulations of ceramic fibers and inorganic binders.

D. Endothermic Latex Compound Sealants: Single-component, endothermic, latex formulations that after cure do not re-emulsify during exposure to moisture.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Latex Mastic Sealants: Single-component, intumescent, latex formulations that after cure do not re-emulsify during exposure to moisture.

G. Intumescent Polyurethane Foam: Sponge-like polyurethane material, containing no fibers, solvents, or Halogens.

H. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

I. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

1. Collars: Factory-manufactured metal restricting collars for housing an intumescent insert with a radial extended flange for fastening to substrate.

J. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

K. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

L. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

M. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer

speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions where firestops and smokeseals are to be installed. Do not proceed until unsatisfactory conditions have been corrected

B. Examine existing firestop penetrations within the Contract Limits and prepare report for all rated penetrations describing their conditions and recommendations for any repairs.

C. Verify penetrating items have been permanently installed and assemblies have been completed prior to sealing.

D. Perform tests to ensure compatibility before applying materials to questionable surfaces and surfaces previously painted or treated with a sealer, curing compound, water repellant, or other coating.

3.2 PREPARATION

A. Clean surfaces to receive materials in accordance with material manufacturer's written instructions. Remove dirt, dust, rust, paint, sealer, curing compound, water repellant, grease, oil, form release agents, and other matter that could impair the bond of the sealant.

1. Verify system components are clean, dry, and ready for installation.

B. Fill voids and cracks in substrate and remove laitance and projections prior to installation of firestops and smokeseals.

C. Prime surfaces, and apply protective separation, for materials as required. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.

D. Mask adjoining surfaces as necessary for protection of adjacent surfaces.

E. For products requiring mixing, comply with manufacturer's instructions for proportioning of materials, mixing equipment, mixing time, and other procedures needed for uniform quality and optimum performance characteristics.

3.3 INSTALLATION

A. Install systems to comply with Performance Requirements and firestop system manufacturer's written installation instructions and published details.

1. Coordinate with other trades to assure that all pipes, conduit, cable, and other items, which penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
2. Install joint fillers to provide support of firestop and smokeseal materials during application and at the position required to produce the cross-sectional shapes and depths relative to joint widths to allow optimum sealant movement capability and develop rating required.

B. Install only anchoring devices, forming/damming/backing materials, clips, sleeves, supports, and other accessories used in actual tests.

1. Remove combustible forming materials and other accessories not indicated as permanent components of firestop systems after installing fill materials have fully cured.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated by directly contacting and fully wetting joint substrates
2. Install materials so they contact and adhere to substrates formed by openings and penetrating items
3. Install to uniform cross-sectional shapes and depths relative to joint width to optimize joint movement
4. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes, tool if necessary
5. Tool non-sag firestop materials immediately after their application and prior to the start of skimming. Form smooth uniform beads of configuration required to produce required rating, eliminate air pockets, and ensure contact and adhesion with substrates. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

D. Areas of work shall be accessible for inspection. Do not cover until each assembly has been accepted.

E. Install firestopping at new penetrations through existing rated assemblies. Rating shall not be less that that of the existing assembly.

3.4 RATED PARTITION IDENTIFICATION

A. Where fire-rated or smoke rated walls extend to roof deck, provide 6-inch high red lettered stencil on each side of the wall, within 12 inches of top of wall, at no more than 20 feet o.c., each side, describing partition rating. Include additional text to read FIRE/SMOKE BARRIER – PROTECT ALL OPENINGS.

3.5 FIELD QUALITY CONTROL

A. Accepted Mock-Up will constitute standard of acceptance for firestop and smokeseal assemblies.

B. Field Testing: Field quality control testing is only required for firestops and smokeseals installed by Non-FCIA Approved Installer.

C. Inspecting Agency: Engage a qualified, independent inspecting agency to inspect firestop and smokeseal systems. Agency shall comply with ASTM E2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

D. Inspection Services: Inspecting of completed firestop and smokeseal system installations shall take place in successive stages as installation of firestop and smokeseal systems proceeds. Do not proceed with installation of firestop and

smokeseal systems for the next area until inspecting agency determines completed work shows compliance with requirements.

1. Inspecting agency shall state in each report whether inspected firestop and smokeseal systems comply with or deviate from requirements.
2. Special Inspections: Conduct inspections per ASTM E2174 and E2393 for conditions prescribed in FBC.

E. Remove and replace firestop and smokeseal systems where inspections indicate that they do not comply with specified requirements.

F. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Proceed with enclosing firestop and smokeseal systems with other construction only after inspection reports are issued and firestop and smokeseal installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess materials adjacent to openings and joints by methods and with cleaning materials approved by manufacturers of systems and of products in which opening and joint occurs.

B. Protect firestopping and smokesealing from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping and smokesealing and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 8400

SECTION 07 9000
JOINT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes interior sealants.

B. VOC limits for sealants and adhesives

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Certifications:

1. Certification by joint sealant manufacturer that sealants, primers, and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds (VOC) if more stringent than limits specified.

    a. Refer to Division 09 Section, Carpet Tile for VOC limits with regards to adhesives for use with carpet products
    b. Refer to Division 09 section, Painting for VOC limits with regards to paints and coatings

2. Certification by sealant manufacturer that sealants, primers, and cleaners comply with Regulation 8, Rule 51 of the Bay Area Air Quality Management District.
3. Certification by adhesive manufacturer that adhesives comply with the South Coast Air Quality Management District Rule 1168.
4. Highlight VOC's for each product

B. Sample warranties

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain joint sealant materials from a single manufacturer for each different product required and who will, if required, send a qualified technical representative to project site for the purpose of advising the Installer of procedures and precautions for the use of the materials.

B. Installer Qualifications: Engage an experienced installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

1. Installer shall be a sealant and caulking subcontractor, authorized or licensed by the sealant manufacturer, with a minimum of 5 years of successful experience in the application of the types of materials required.

C. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented

according to ASTM E 548.

D. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact or affect joint sealants to joint sealant manufacturers for compatibility and adhesion testing as indicated below:

1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

   a. Perform tests under normal environmental conditions that will exist during actual installation.

2. Submit minimum of 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying Work.
4. Investigate materials failing compatibility or adhesion tests and obtain joint sealant manufacturer's written recommendations for corrective measures, including use of specially formulated primers.
5. Testing will not be required when joint sealant manufacturer is able to submit joint preparation data required above that are acceptable to Architect and are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

E. Product Testing:

1. Provide joint sealant based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24 month period preceding date of Contractor's submittal of test results to Architect.

   a. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering.
   b. Include test results performed on joint sealants after they have cured for 1 year.

2. VOC Limits (South Coast Air Quality Management District Rule 1168) for adhesives, sealers, and primers:

   a. Architectural Applications:

1)	Indoor Carpet Adhesives	50 g/L
2)	Carpet Pad Adhesives	50 g/L
3)	Wood Flooring Adhesives	100 g/L
4)	Ceramic Tile Adhesives	65 g/L
5)	Dry Wall and Panel Adhesives	50 g/L
6)	Subfloor Adhesives	50 g/L
7)	Rubber Floor Adhesives	60 g/L
8)	VCT and Asphalt Adhesives	50 g/L

9)	Multipurpose Construction Adhesives	70 g/L
10)	Structural Glazing Adhesives	100 g/L
11)	PVC Welding	510 g/L
12)	CPVC Welding	490 g/L
13)	ABS Welding	325 g/L
14)	Plastic Cement Welding	250 g/L
15)	Cove Base Adhesives	50 g/L
16)	Adhesive Primer for Plastic	550 g/L
17)	Contact Adhesive	80 g/L
18)	Special Purpose Contact Adhesive	250 g/L
19)	Structural Wood Member Adhesives	140 g/L
20)	Sheet Applied Rubber Lining Operations	850 g/L
21)	Top and Trim Adhesive	250 g/L

b. Substrate Specific Applications:

1)	Metal to Metal	30 g/L
2)	Plastic Foams	50 g/L
3)	Porous Material (Except Wood)	50 g/L
4)	Wood	30 g/L
5)	Fiberglass	80 g/L
6)	Architectural	250 g/L
7)	Roadway	250 g/L
8)	Other	420 g/L

c. Sealant Primers: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24)

1)	Architectural,	250 g/L
2)	Non-porous Substrates	250 g/L
3)	Porous Substrates	775 g/L
4)	Plastic Foam Adhesives:	50 g/L.
5)	Gypsum Board and Panel Adhesives:	50 g/L.
6)	Multipurpose Construction Adhesives:	70 g/L.
7)	Fiberglass Adhesives:	80 g/L.
8)	Contact Adhesive:	80 g/L.
9)	Other Adhesives:	250 g/L.
10)	Single-Ply Roof Membrane Sealants:	450 g/L.
11)	Nonmembrane Roof Sealants:	300 g/L.

3. VOC Limits (Green Seal Standard for Commercial Adhesives GS-36) for aerosol adhesives:

a. Aerosol Adhesives:

1)	General Purpose Mist Spray	65% VOC's by weight
2)	General Purpose Web Spray	55% VOC's by weight
3)	Special Purpose Adhesives	70% VOC's by weight

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration, pot life,

curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature (or below 40 deg F) conditions are outside the limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than allowed by joint sealant manufacturer for application indicated.
4. Until contaminants capable of interfering with adhesion are removed from joint substrates.

B. Preparation of joint surfaces, backing, and the conditions under which the sealant and caulking is to be installed shall conform to manufacturer's recommendations.

1. Use of bond break tape is prohibited without the expressed permission of the Architect. Each situation will be evaluated with regard to inability to properly use backer rod to prevent adhesion.

1.7 WARRANTY

A. All exterior and building envelope weathertight and watertight sealants shall be warranted by the sealant manufacturer for a period of twenty years from the Date of Substantial Completion. Include coverage for installed sealants and accessories which fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

B. All exterior and building envelope weathertight and watertight sealants shall be guaranteed by the installing contractor for a period of five (5) years from the Date of Substantial Completion, to be weathertight, watertight and moisture tight. Correct defective or failed joints within the warranty period.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:

1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Surface Hardness: Provide types of sealant to withstand anticipated abrasive or possible indentation as recommended by manufacturer.

C. Colors: By Architect from manufacturer's full range of standard colors.

2.2 MATERIALS

A. General

1. Where the term "Acceptable Standard" is used within this Section, it refers to the manufacturer and product listed, which is specified as the type and quality required for this Project.
2. Products of other manufacturers will be considered, providing their products equal or exceed the quality specified, and they can provide products of the type and quality required.

B. Caulking Compounds (Acrylic Latex Sealant)

1. Latex rubber modified, acrylic emulsion polymer sealant compound; manufacturer's standard, one part, non-sag, mildew resistant, acrylic emulsion sealant complying with ASTM C834, recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.
2. Acceptable Standard

a. Sonolac; BASF
b. Acrylic Latex Caulk; Tremco, Inc.
c. Acrylic Latex Caulk with Silicone; DAP, Dayton, Ohio

C. Miscellaneous Materials

1. Primer: Type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer substrate tests and field tests.
2. Cleaners for Nonporous Surfaces: Non-staining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in service performance.
3. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

2.3 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant: Manufacturer's standard non-sag, sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame spread and smoke developed ratings of less than 25 per ASTM E 84.
3. AC-20 FTR Acoustical and Insulation Sealant, Pecora Corp.
4. Smoke and Sound sealant by Tremco, inc.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

1. Acoustical Sealant for Concealed Joints:

   a. BA-98, Pecora Corp.
   b. Tremco Acoustical Sealant, Tremco, Inc.
   c. Other as approved by Architect

2.4 JOINT SEALANT BACKING

A. Provide sealant backings of material and type that are non-staining, compatible with substrates, sealants, primers and other joint fillers, and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to produce optimum sealant performance:

   1. Type C: Closed-cell material with a surface skin

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer. Provide self adhesive tape where applicable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants complying with recommendations of sealant manufacturer and the following requirements:

   1. Remove all foreign material from joint substrates that could interfere with adhesion, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, and surface dirt.
   2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from cleaning operations by vacuum or blowing out joints with oil-free compressed air.
   3. Remove laitance and form release agents from concrete.
   4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with cleaners that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant

manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 SELECTION OF MATERIAL

A. Caulking compounds shall be used for interior nonmoving joints and at locations specifically indicated on Drawings.

B. Acoustical joint sealants shall be used at all walls that are STC rated or where sound attenuation blankets are used.

3.4 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

1. Interior joints which require caulking are to be caulked with the specified caulking compound, unless noted otherwise.
2. Exterior joints which require sealant are to be filled with one of the specified sealants even though the note may read "Caulked".
3. Joints to be filled shall be dry and free from dust, dirt, oil, and grease at the time of application or caulks or sealants.
4. Expansion and control joints in exterior walls shall have the joint filler material built into the wall, or between wall and slab, at the time of construction.
5. Masking: Metal shall be masked with masking tape, as well as other surfaces where it's required to prevent the sealant smearing the adjacent surface. Upon completion of the caulking, remove the tape.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.
b. Do not stretch, twist, puncture, or tear joint fillers.
c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

E. Installation of Sealants: Install sealants by proven techniques that result in

sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.5 CLEANING AND PROTECTION

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

B. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 9000

SECTION 08 1100
METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes hollow metal doors and frames.

B. Refer to Division 08 Section, Glazing for glass requirements.

1.2 DEFINITIONS

A. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.3 SUBMITTALS

A. Product Data: Details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

B. Shop Drawings:

1. Show elevations, details and methods of assembling sections, hardware locations and installation methods, dimensions, shapes of materials, anchorage and fastening methods, wall opening construction details, and weatherstripping.
2. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Documents.

C. Label Construction Certification: For fire-rated assemblies exceeding limitations of labeled assemblies, submit manufacturer's certification that each assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1. Each label is to include the fire protection rating of the individual frame/door assembly.

D. Sample warranty

1.4 QUALITY ASSURANCE

A. Provide hollow metal work from a single manufacturer complying with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" ANSI/SDI A250.8 and as specified.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Door frames shall receive a permanent embossed label. Window and side light frames shall receive a mylar label.

C. Hollow metal supplier shall be a qualified direct distributor of products to be furnished. In addition, the distributor shall have in their regular employment an A.H.C./C.D.C. who will be available at reasonable times to consult with the Architect regarding matters affecting the doors and frames.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish.

B. Inspect units upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged units as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4 inches high wood blocking. Avoid use of non-vented plastic or canvas shelters that could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4 inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products from one of the following manufacturers:

1. Amweld Building Products
2. Ceco Door Products
3. Steelcraft, an Ingersoll-Rand business
4. Curries Company
5. Mesker Door, Inc.
6. Firedoor Corp.
7. Architectural Openings, Inc.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Galvanized Steel Sheets: ASTM A 653, Commercial Steel (CS), Type B; with minimum A60 metallic coating.

C. Supports and Anchors: Fabricate of not less than 18-gage Commercial Steel (CS) 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Asphaltic Emulsion Coating: Water-based, brush applied, emulsion dampproofing.

1. Provide products within VOC limits specified for Non Porous sealant primer in Division 07 Section, Joint Protection.

2.3 FABRICATION, GENERAL

A. Fabricate units rigid, free from defects, warp, or buckle. Form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the

manufacturer's plant. Identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the Site.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

1. Lock edge of doors: Bevel 1/8 inch in 2 inches.

C. Fabricate panels and edge channels from cold rolled sheet steel.

D. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold rolled or hot rolled steel (at fabricator's option).

E. Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws.

F. Hardware Preparation:

1. Prepare hollow metal units to receive mortised and concealed door hardware, including cutouts, reinforcing, drilling, and tapping in accordance with final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI/SDI A250.6 and ANSI/DHI A115 Series "Specifications for Door and Frame Preparation."
2. Reinforce hollow metal units to receive surface applied hardware. Drilling and tapping for surface applied door hardware may be done on Site.
3. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with recommended hardware locations specified in ANSI/SDI A250.8.
4. Reinforce all steel doors and frames to receive surface mounted closers, whether or not scheduled to receive them.

G. Shop Painting

1. Clean, treat, and shop paint all surfaces of fabricated hollow metal doors and frames, including galvanized surfaces plus back priming at the following conditions:

a. All exterior doors in concrete or masonry
b. Interior doors in concrete or masonry. Back priming shall not void any labeling requirements for fire rated assemblies.

2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before the application of the shop coat of paint.
3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive field applied paint.

a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.4 DOOR TYPES

A. Conform to the Steel Door Institute Standards, ANSI/SDI A250.8, and as follows:

B. Interior Doors: Grade II, 1-3/4 inch heavy duty, 18 gage cold rolled, Model 1, full flush, hollow steel construction.

1. Form door face sheets from one sheet of metal with no face seams. Seams on vertical door edges shall be tight, smooth, and devoid of irregularities. A kraft resin impregnated honeycomb core or rigid polystyrene slab shall be permanently bonded to both door skins with adhesive recommended by the manufacturer.

C. Seamless construction by welding and filling at factory only.

2.5 DOOR ACCESSORIES

A. Glass Stops and Moldings: Provided for vision light openings.

1. Glaze doors from the secure side.

B. Verify undercut requirements with Division 08 Section, Finish Hardware, for exterior doors with thresholds. Standard undercut will not be acceptable for low profile handicap thresholds.

2.6 FRAME TYPES

A. Frames for Interior Door and Window Openings: 16 gage, fabricated from cold rolled sheet steel.

B. Welded Frames: Weld flush face joints continuously, grind, fill, dress, and make smooth, flush and invisible. Knock-down frame types are not permitted.

2.7 FRAME ASSEMBLIES

A. Frame Anchors

1. Wall anchors for frame attachment to masonry construction: Adjustable, flat, corrugated or perforated 'T' shaped anchors with leg not less than 2 inches wide by 10 inches long or masonry "wire" type not less than 3/16 inch diameter.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

a. Size anchors to accommodate frame jamb depth and face dimension on all welded frames

3. Floor anchors:

a. Angle clip type
b. 16 gage minimum
c. Two fasteners per jamb
d. Weld to the bottom of each jamb

4. Head Struts: For frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure where called for on schedule.
5. Sleeve anchors shall be fire rated for the types of openings required.

B. Stops and Beads: 20 gage, installed on the interior side of exterior frames.

C. Sidelites, Transom Bars, and Interior Window Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

D. Door Silencers: Drill stops and install 3 silencers on strike jambs of single swing frames and 2 silencers on heads of double swing frames.

2.8 FIRE DOORS AND FRAMES

A. Provide approved and labeled hollow metal fire doors and frames at locations indicated in Door Schedule.

B. Labeled metal frames are required for labeled wood doors.

C. All labels shall be metal, attached to the frame where required by code. Stamped labels will not be acceptable.

2.9 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020 inch thick, cold-rolled steel sheet set into0.032 inch thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install standard steel doors, frames, and accessories in accordance with final Shop Drawings and the Contract Documents.

B. Placing Frames: Comply with ANSI A250.11.

1. Except for frames located at existing concrete, masonry or drywall installations, place frames prior to construction of walls.
2. Set frames, plumbed, aligned, and braced until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.

a. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

3. In masonry construction, locate 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Coordinate installation to allow for grouting frames solid. Do not allow frames to deform by grout forces.
4. Install fire-rated frames in accordance with NFPA Standard No. 80.
5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels.
6. Anchor bottom of frames to floors with expansion bolts or with power fasteners. Where frames require ceiling struts or other structural overhead bracing, anchor to ceilings or structural framing above, as indicated or specified.

7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb.
8. Finished work shall be rigid, neat in appearance, and free from defects. Form molded members straight and true with joints coped or mitered, well formed, and in true alignment. Welded joints on exposed surfaces shall be dressed smooth so they are invisible after finishing.
9. Recess bolt heads, bondo and sand smooth where anchor bolts are used in concrete or masonry openings
10. Provide filler plate at all hardware preps, such as hinge and strike preps, that are unused.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI A250.8.

1. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
2. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
3. Install fire-rated doors with clearances as specified in NFPA 80

3.2 ADJUST AND CLEAN

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

3.3 FIELD QUALITY CONTROL

A. Damaged work will be rejected. Replace with new work at no additional cost to the Contract.

B. After installation, protect doors and frames from damage during subsequent construction activities.

END OF SECTION 08 1100

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes solid core wood veneer doors

1.2 REFERENCES

A. References:

1. ASTM E152 – Methods of Fire Tests of Door Assemblies
2. AWI (AWS) – Quality Standards of the Architectural Woodwork Institute
3. NFPA A80 – Fire Doors and Windows

1.3 SUBMITTALS

A. Shop Drawings

1. Indicate location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, and fire ratings.
2. Indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
3. Provide schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings and Schedules.

B. Samples:

1. 6 inch by 6 inch (approximately) section of door faces with solid wood edging, showing factory finish and representing typical range of color and grain for veneer and solid lumber required.
2. Metal Louvers: Blade and frame in 6" lengths
3. Metal Frames for Light Openings: Metal light frames in 6" lengths

C. Sample warranty

1.4 QUALITY ASSURANCE

A. AWI Quality Standard: Eighth edition of the "Architectural Woodwork Quality Standards"; including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of WDMA quality standard.

B. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction.

C. Manufacturer: Obtain doors from a single manufacturer.

D. VOC levels for adhesives and finishes to meet minimum requirements specified in Division 07 Section, Joint Protection.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect each door for shipment and handling.

B. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of WDMA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors," as well as with manufacturer's instructions.

C. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:

1. Referenced AWS quality standard including Section 100-S-3 "Moisture Content".

1.7 WARRANTY

A. Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. The manufacturer shall warrant each separate door installation against manufacturing defects for the “lifetime of original installation”, including cost of refinishing and rehanging if doors do not comply with specified tolerances. Include coverage for delamination, warping beyond specified installation tolerances, defective materials and telegraphing core construction.

C. Contractor's Responsibilities: Replace all doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty or where doors have been damaged due to construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products of the following manufacturers are acceptable:

1. Algoma Hardwoods, Inc., a Division of Masonite Architectural Door Systems
2. Lambton Doors
3. Marshfield DoorSystems, Inc., a Division of Masonite Architectural Door Systems
4. Mohawk Flush Doors, Inc., a Division of Masonite Architectural Door Systems
5. Oshkosh Architectural Wood Door Company
6. VT Industries, Inc.
7. Eggers Industries

2.2 MATERIALS AND COMPONENTS

A. Provide interior flush wood doors conforming to the following requirements:

1. Faces: Plain Sliced Red or White Oak veneer (Matching existing),

minimum 5 inch flitch, Grade A. Variations allowed per Section 1300-G-17, AWI Quality Standards, latest edition.

2. Faces: Rotary Cut, Natural Birch veneer, minimum 5 inch flitch, Grade A. Variations allowed per Section 1300-G-17, AWI Quality Standards, latest edition.
3. Core Construction: Structural composite lumber (SCL-5)
4. Edges: Provide manufacturers standard, laminated edge construction with improved screw-holding capability and split resistance. Edges shall match face veneer, sand and finish to match door faces.
5. Face Panels: Manufacturer's standard 2 ply hot pressed panels with Type I glue.
6. Matching: Pairs of doors shall be book matched grain as pairs on both sides. Provide end matched transoms.
7. Thickness: 1-3/4 inches, unless noted otherwise.

B. Fire-Rated Solid Core Doors

1. Faces: Provide faces and grade to match non-rated doors as specified above.
2. Core Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
3. Stile Construction: Provide stiles that provide maximum screw withdrawal rate for use with full mortise hinges. Withdrawal rate shall be not less than 740 lbs. Stiles shall be manufacturer's standard.
4. Edges: Species to match face veneer.
5. Supply pairs of doors with up to 90 min. rating with manufacturer's standard steel edges and steel astragal, factory applied and factory prepared for scheduled hardware. Where pairs of labeled doors are used in a means of egress with 2 vertical rod exit devices, provided manufacturer's standard edges (metal or treated) as tested without the steel astragal.
6. For labeled doors to receive glass, provide manufacturer's standard frame, factory primed, and approved for use in door of fire rating indicated. Factory glaze when available.
7. Lock Blocks: Blocking as required for hardware installation to eliminate thru-bolting.
8. Provide solid blocking in doors whether or not scheduled to receive closers. Through-bolt attachment of hardware is not allowed without written permission of Architect.

2.3 PREFITTING AND PREPARATION FOR HARDWARE

A. Pre-fit and pre-machine doors at factory, including beveling both edges 1/8 inch in 2 inches.

B. Comply with tolerance requirements of AWI for pre-fitting. Machine doors for hardware requiring cutting doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Coordinate with the metal frame supplier the locations of hardware mortises in metal frames to verify dimensions and alignment before proceeding with

machining in factory.

D. Light openings and other detail work shown shall be in accordance with manufacturer's standard details or as detailed by the Architect.

2.4 LOUVERS AND LIGHT FRAMES

A. Light Frames: Provide wood stops for glass. Provide metal stops where fire-rated doors are required to have fire rated glazing.

B. Metal Louvers Size, type and profile shown and fabricated from the following:

1. Steel: 20-gage, galvanized and factory primed for field paint finish.
2. Provide fire-rated metal louvers with fire-dampers for fire-rated doors.

C. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 18-gage cold-rolled steel, approved for use in door of fire-rating indicated.

1. Field painted metal light frames. Color as selected by Architect.

2.5 FABRICATION

A. Fabricate flush wood doors to produce doors complying with following requirements:

1. Factory-prefit and pre-machine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:

a. Comply with tolerance requirements of AWI for pre-fitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
b. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.

B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

1. Factory install louvers and lights in prepared openings.

2.6 SHOP PRIMING

A. Shop seal faces and edges of doors with pre-treatments and primer coat compatible with finish specified in Division 09 Section, Painting.

1. Doors scheduled to be painted may be rotary birch veneer, factory primed.

2.7 FACTORY FINISHING

A. Comply with referenced AWI quality standard including Section 1500 "Factory Finishing".

B. Prefinish wood doors at factory.

1. Doors scheduled to be factory finished to be Red Oak veneer

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect and sheen.

1. AWI Grade: Custom
2. Finish: AWI Catalyzed Polyurethane.
3. Staining: to match existing.
4. Effect: Open grain finish.

D. Factory finished doors damaged after installation shall be replaced with factory finished doors at no additional cost to the Owner.

1. Field repair of doors will not be allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb, parallel jambs and level heads. Correct frames prior to hanging doors.
2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 DOOR INSTALLATION

A. Pre-fit Doors: Fit to frames for uniform clearance at each edge and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

1. Install non-rated doors in accordance with manufacturer's instructions and as shown.
2. Install fire rated doors in corresponding fire rated frames in accordance with requirements of NFPA No. 80.

B. Clearance: For non-rated doors provide clearances of 1/8-inch at jambs and heads; 1/8-inch at meeting stiles for pairs of doors; and 1/2-inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.

1. For fire rated doors provide clearances complying with NFPA 80.

C. Doors having any of the following defective conditions will not be accepted:

1. Not operating properly, such as swinging, sliding or latching
2. Damaged face or edge.
3. Unsealed edges, tops and bottoms.
4. Irregularities in surface finish, such as roughness, "skips", "runs" or other blemishes in color or gloss.

D. If operation defects cannot be corrected by repairing or rehanging, replace door with new unit.

E. Doors damaged prior to or during installation shall be replaced at no cost to the Owner.

F. Factory Finished Doors: Restore finish before installation, if fitting or machining

is required at the job site and permitted by warranty.

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Protect doors as recommended by door manufacturer to ensure that doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08 1416

FINISH HARDWARE
Section 08710

PART I - GENERAL

1.01 WORK INCLUDED

A. The work in this section shall include furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.
B. Related work specified in other Sections:
   1. 08 11 00 Hollow Metal Doors and Frames
   2. 08 43 00 Aluminum Doors and Frames
   3. 08 14 00 Wood Doors and Frames
   4. Division 28- Fire Alarm & Detection
   5. Division 26- Electrical

1.02 REFERENCES

A. American with Disabilities Act of 1990 (ADA).
B. American Disabilities Act Accessibility Guidelines (ADDAG).
C. Florida Building Code and Dade County Hurricane Requirements.
D. All State and Local codes including Fire, lifesafety and hurricane codes.
E. IBC – International Building Codes

1.03 DESCRIPTION OF WORK

A. Furnish labor and material to complete hardware work indicated, as specified herein, or as may be required by actual conditions at building.
B. Include all necessary screws, bolts, expansion shields, other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.
C. All hardware shall meet the requirements of Federal, State and Local codes having jurisdiction over this project, notwithstanding any real or apparent conflict therewith in these specifications.

D. FIRE-RATED OPENINGS:
   1. Provide hardware for fire-rated openings in compliance with A.I.A. (NBFU) Pamphlet No. 80, NFPA Standards NO. 101, UBC 702 (1997) and UL10C. This requirement takes precedence over other requirements for such hardware. Provide only hardware that has been tested and listed by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
   2. Where panic exit devices are required on fire-rated doors, provide supplementary marking on door UL label indicating Fire Door to be equipped with fire exit hardware and provide UL label on exit device indicating “Fire Exit Hardware”.

E. FASTENERS:
   1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
   2. Furnish each item complete with all screws required for installation. Typically, all exposed screws installation.

3. Insofar as practical, furnished concealed type fasteners for hardware units that have exposed screws shall be furnished with Phillips flat head screws, finished to match adjacent hardware.
4. Door closers and exit devices to be installed with closed head through bolts (sex bolts).

F. All Finish Hardware to be installed per manufacturer's instructions and with manufacturer's fasteners.

1.04 QUALITY ASSURANCE

A. The supplier to be a directly franchised distributor of the products to be furnished and have in their employ an AHC (Architectural Hardware Consultant). This person is to be available for consultation to the architect, owner and the general contractor at reasonable times during the course of work.
B. The finish hardware supplier shall prepare and submit to the architect six (6) copies of a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. He shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.
C. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.
D. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.
E. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.
F. The hardware manufactures are to supply both a pre-installation class as well as a post-installation walk-thru with the general contractor/construction manager, hardware supplier and Manufacturer's representative at the request of the General Contractor/Construction Manager. This is to insure proper installation and provide for any adjustments or replacements of hardware as required using installation manuals, hardware schedule, templates, physical product samples and installation video's, if available.
    1. When electrical or pneumatic hardware is specified this meeting shll also include the following trades/installers: Electrical, Security, Alarm systems and Architect.
    2. Meeting to convene one week prior to commencing work of this Section.
    3. Coordinate with Section 01039
    4. The hardware supplier shall include the cost of this seminar in his proposal.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Wrap, protect finishing hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

1.06 WARRANTY

A. The material furnished shall be warranted for one year after installation or longer as the individual manufacturer's warranty permits.
B. Overhead door closers shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a period of ten (10) years commencing on the Date of Final Completion and Acceptance, and in the event of failure, the

manufacture is to promptly repair or replace the defective with no additional cost to the Owner.

PART II - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. To the greatest extent possible, obtain each kind of hardware from only one manufacturer.
B. All numbers and symbols used herein have been taken from the current catalogues of the following manufacturers.

PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
1) Hinges	Ives	Hager, Bommer
2) Continuous Hinges	Ives	Hager, Bommer
3) Locks & Latches	Schlage	Falcon, Best
4) Cylinders, Keys, Keying	Schlage	None (owners standard)
5) Electronic Locks/Standalone	Schlage Electronics	None (owners standard)
6) Exit Devices	Von Duprin	Falcon, Sargent
7) Door Closers	LCN	Falcon, Sargent
8) OH Stops/Holders	Glynn Johnson	Rixson
9) Magnetic Hold Opens	LCN	Falcon
10) Wall Stops/Floor Stops, Flushbolts	Ives	Rockwood
11) Kick Plates	Ives	Rockwood
12) Threshold/Weather-strip	Zero	National Guard
13) Silencers	Ives	Glynn Johnson

2.02 FINISH OF HARDWARE:

A. Exterior Hinges to be Stainless Steel (32D), Interior Hinges to be Satin Chrome (26D). Door Closers to be Aluminum. Locks to be Satin Chrome (26D), Exit Devices to be Satin Chrome (26D). Overhead Holders to be Satin Chrome (26D), Flat Goods to be Satin Chrome (26D) or Stainless Steel (32D) and the Thresholds to be Mill Finish Aluminum.

2.03 HINGES AND PIVOTS:

A. Exterior butts shall be Stainless Steel if continuous hinges cannot be used. Butts on all out swinging doors shall be furnished with non-removable pins (NRP).
B. Interior butts shall be as listed in hardware sets.
C. Doors 5’ or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2’6” in height or fraction thereof. Dutch door shall have two (2) butts per leaf.
D. Continuous Geared hinges, Ives 224HD, to be used on all exterior openings, Aluminum and Hollow Metal unless otherwise specified in hardware sets.

2.04 KEYING:

A. All locks and cylinders on the exterior of the buildings shall be 11 pin Primus level 3 by Schlage Lock Company unless specified otherwise. Interior Cylinders to be either Primus or classic keyway per Orange County Locksmith, Larry Puckett. All new bittings shall be issued by Schlage in order to maintain the integrity of the existing Schlage key system.

B. All keys to be Primus level 3 by Schlage Lock Company even if the cylinders are not Primus.
C. All Permanent cylinders to be interchangeable core cylinders.
D. Provide Permanent cores keyed to owners existing system.
E. Key meeting to be held with Orange County, Mr. Larry Puckett . 407-836-7411 or Cell 407-402-4420. Confirm if keying is to be done by Orange county.
F. Temporary core cylinders to be provided during the construction period. Construction cores to be returned to the supplier.
G. Provide keys as follows: Two (2) each change keys per lock and Two (2) Permanent Core Control Keys. Confirm if Master or Grand Master keys are needed with Orange County locksmith.
H. Provide Cut keys as follows Nine cut (9) Construction keys. Two cut(2) Construction Core Control Keys.
I. Provide 1 Bitting list for orders placed with Schlage lock Company unless the bittings are being provided by Orange County.
J. All permanent keys and cores must be delivered to Orange County Locksmith, Larry Puckett by registered mail direct from the factory. 2010 East Michigan St. Orlando, Florida, 32806. Permanent keys will be furnished to the Owner's Representative prior to occupancy by Orange County Locksmith.

2.05 LOCKSETS:

A. For exterior use Locksets shall be Heavy Duty Cylindrical type, Grade 1, unless specified otherwise, in "ND" Series, Sparta Design as manufactured by Schlage Lock Company.
   1. Acceptable Substitutions:
      A. Falcon T series Quantum design
      B. Best 93K 14H design

B. Deadbolts shall be heavy Duty, Grade 1, unless specified otherwise, in B600/B700 Series with interchangeable core cylinders as manufactured by Schlage Lock Company.

C. All locksets to have VandlGard levers where the locked lever freely rotates up and down while remaining securely locked and increase resistance to over-rotation of the lever.

D. Locksets shall be Heavy Duty Mortise type, Grade 1, unless specified otherwise, in Schlage L9000 Series, 17A design as manufactured by Schlage lock company
   1. Acceptable substitutions:
      A. Falcon "MA" Series, QG Design
      B. Best 45H Series 14H Design

2.06 EXIT DEVICES:

A. All devices shall be Von Duprin 98 Series in types and functions specified. All devices must be listed under "Panic Hardware" in accident equipment list of Underwriters Laboratories. All labeled doors with "Fire Exit Hardware" must have labels attached and be in strict accordance with Underwriters Laboratories.
B. All exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory.
C. All panic devices shall be provided with a dead-latching feature to prevent latchbolt tampering.

D. Exterior lever trim to have breakaway lever capability and match the design being provided on the mortise or cylindrical locksets.
E. Rim type exit devices shall be used exclusively with the exception that surface mounted vertical rod type devices may be used where tow-point latching is required for doors in hurricane hardened portions of buildings or at double egress fire rated door applications.
F. In no circumstances shall concealed vertical rod type devices be used. Where required to use three point latching devices, provide complete protective covers for surface mounted vertical rods.
    1. Acceptable substitutions:
        A. Falcon 25 Series L
        B. Sargent 8800 Series 713-8 ET_

G. Keyed Removeable center mullions shall be used on all exterior paired doors with exit devices. However, this requirement may be omitted when doors are located in Enhanced Hurricane Protection Areas (EHPA) buildings and the only exit devices approved for use on hurricane resistant door require vertical rod mechanical equipment or electrical rooms that have paired doors.
    1. Von Duprin KR4954
    2. Von Duprin UL Listed: KR9954
    3. Von Duprin KR5764 for Exterior Aluminum storefront
    4. Acceptable Substitutions:
        A. Sargent L980 w/ Keyed removable mullion
        B. Falcon KR4023 or KRF4023

2.07 DOOR CLOSERS:

A. All mechanical closers shall be LCN 4040XP Series for exterior doors and 4030 for interior as specified in hardware sets, having non-ferrous covers, forged steel arms separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arm mounted on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Furnish with non-hold open arms unless otherwise indicated.
B. All Combination Electronic Door closers/holders shall be LCN 4040SE single point or 4040ME Series, as specified, providing a multi point hold open and will release the holding mechanism upon current interruption and the door closes. For use on fire and smoke barrier doors where specified in hardware sets. Must interface with fire alarm system.
C. Door closer cylinders shall be of high strength cast iron construction to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory.
D. Door closers shall utilize temperature stable fluid capable of withstanding temperature ranges of 120 degrees Fahrenheit to -30 degrees Fahrenheit, without requiring seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with the standards UBC 7-2 (1997) and UL 10C.
E. Door closers shall incorporate tamper resistant non-critical screw valves of V-slot design to reduce possible clogging from particles within the closer. Closers shall have separate and independent screw valve adjustments for latch speed, general speed, and hydraulic backcheck. Backcheck shall be properly located so as to effectively slow the swing of the door at a minimum of 10 degrees in advance of the dead stop location to protect the door frame and hardware from damage. Pressure relief valves (PRV) are not acceptable.

1. Acceptable substitutions:
    A. Falcon SC70
    B. Sargent 250 Series

2.08 OVERHEAD HOLDERS AND STOPS:

1. Overhead holders/stops to be used where wall or floor stops are not useable. Use Glynn Johnson 90 series on exterior openings and high use interior openings and 450 series on interior medium to low use openings.
2. Acceptable Substitutions:
    a. Trimco
    b. Hager

2.09 MAGNETIC HOLDERS:

1. To be fail-safe and to be released when current is interrupted by the fire alarm.
2. Furnish model to hold door away from wall to allow for any trim on pull side of door.
3. Approved Manufacturer: LCN SEM 7800 series.

2.10 TRIM AND PLATES:

A. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 8" high, mop plates to be 4" high. All plates shall be one and one half (1-1/2) inches less full width of single doors and one (1) inch at pairs of doors Where glass or louvers prevent this height, supply the height equal to height of bottom rail less one (1)inch.
Armor plates to be 48" less three (3) inches less than door width. Armor Plates on openings with Exit devices provide height to bottom of exit device cases. At locksets, latchsets, or push Pull latches cut for rose or escutcheons. Bevel top edges of all armor plates. All screw holes to be drilled and countersunk in horizontal edges for oval head undercut screws.

B. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

2.11 DOOR STOPS:

A. Door stops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers equal to Ives 400 Series are preferred, but where not practical furnish floor stops equal to 436 or 438 series or where not practical use Ives WS33 Wall stop with length to exceed projection of all other hardware. Wall holders use Ives WS40 where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 90 series and 450 Series as specified in Hardware schedule.

2.12 THRESHOLDS ,WEATHERSTRIP,SWEEPS:

A. Thresholds to meet handicap requirements. Furnish 5" depth. Furnish full wall opening width when frames are recessed. Cope in front of mullions if thresholds project beyond door faces. Zero type 545.
B. Weather-stripping – Apply to head and jambs where specified. Zero type 429A
C. Door Sweeps – Surface Zero type 8198AA
D. Acceptable Subsitutions: Reese, National Guard

E. Drip Caps to be provided at exterior openings not protected by overhangs. Should be 4" wider than door.

2.13 DOOR SILENCERS:

A. Furnish rubber door silencers equal to Ives SR64/SR65 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

2.14 LOCK PROTECTORS:

Lock protector shall eliminate gap between door and frame. No exposed fasteners on face of unit. Furnish Ives LG10 unless otherwise indicated in hardware sets.

2.15 KEY CABINET:

A. Telkee WC Series with Key loan record system, pre-indexed by Hardware Supplier. Shall accommodate all keys with 100% future expansion.

B. Acceptable substitutions: Lund, HPC.

PART III - EXECUTION

3.01 INSTALLATION:

A. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.

B. Contractor to provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

C. No hardware is to be installed until the hardware manufactures have provided a pre-installation class. This is to insure proper installation of the specified products.

3.02 ADJUSTING AND CLEANING:

A. Contractor shall adjust all hardware in strict compliance with manufacturer's instructions. Prior to turning project to owner, contractor shall clean and make any final adjustments to the finish hardware.

3.03 PROTECTION:

A. Contractor shall protect the hardware, as it is stored on construction site in a covered and dry place.

B. Contractor shall protect exposed hardware installed on doors during the construction phase.

3.04 KEY CABINET:

A. Set up and index one (1) Key Cabinet that allows room for expansion for 100% of the number of keys for the project.

3.05 HARDWARE SCHEDULE:

A. The following schedule is furnished for whatever assistance it may afford the contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same as required for similar purposes. Quantities listed are for each pair of doors or for each single door.

B. This hardware schedule was prepared by.

SECTION 09 2216
NON STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Non-load-bearing steel framing

1.2 SUBMITTALS

A. Shop Drawings: Show both rated and non-rated deflection track details. Include testing laboratory's assembly number for the rated conditions.

B. Design analysis data showing design loads, stud gages, and necessary bracing for each condition.

1. Profile equivalence as approved by Structural Engineer.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain steel framing members for gypsum board assemblies from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover, dry, and protected against damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Steel Framing and Furring:

a. Clark Dietrich Building Systems
b. Consolidated Fabricators Corp.
c. Marino\WARE

1) StudRite by Marino/WARE is acceptable at contractor's option when utilities within walls is congested.

2. Rated Deflection Track:

a. Fire Track by Firetrak Corp.
b. SLP-TRK by Sliptrack Systems
c. Snap Track by Total Steel Solutions
d. Slotted Stud by Steeler Inc.
e. The System by Metal-Lite Inc.
f. FAS Track 1000 or SLT Slotted Track by Marino\WARE

2.2 STEEL FRAMING FOR WALLS AND PARTITIONS

A. Provide steel framing members complying with the following requirements:

1. Component Sizes and Spacings: Comply with ASTM C754 under the following maximum deflection and lateral loading conditions:

a. Maximum Deflection at 5 pound-foot per square foot:

1) Painted Interior Partitions: L/240
2) Tiled Interior Walls: L/270
3) Large Format Tiled Walls: L/360

2. Protective Coating: G-40 hot-dip galvanized coating per ASTM A653.

B. Steel Studs and Runners: ASTM C645

C. Steel Rigid Furring (Hat) Channels: ASTM C645, hat-shaped, 7/8-inch deep, 20 gage.

D. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

E. Unless indicated otherwise, metal stud framing shall be formed from the following gage metal. If two conditions apply in the following listing, use the heavier gage:

1. Framed openings (heads and jambs of door and window openings) - 16 gage.

a. 16 gage studs include both (2) studs at each jamb, full height, and headers.

2. Remaining Metal Studs: Minimum 20 gage necessary to achieve the deflection requirement

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLING STEEL FRAMING, GENERAL

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer.

C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement. Use vertical sliding slide clip application or use of deflection track and plate track two-piece system, or slip-joint with U-channel.

1. Where building structure abuts ceiling perimeter or penetrates ceiling.

2. Where partition framing and wall furring abut structure, including steel beams, steel joists, at bottom of roof decks and floor decks, except at floor.

    a. Provide slip-type joints to attain lateral support and avoid axial loading.

3. Rated Deflection Track: Maintain continuity of fire-resistance-rated assembly indicated.

D. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

3.3 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.

1. Where metal framing is installed directly against exterior walls, install asphalt felt strips between studs and wall.

    a. Metal framing includes Z-furring channels, hat-shaped furring, and metal studs.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Cut studs 1/2 inch short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. For STC-rated and fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Install steel studs and furring in sizes and at spacing indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified.

1. Install metal studs at 16 inches o.c. at partitions scheduled to receive tile finishes.

E. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor

clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

END OF SECTION 09 2216

SECTION 09 2900
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Gypsum board

1.2 QUALITY ASSURANCE

A. Refer to "Recommended Specification on Levels of Gypsum Board Finish" published by the Gypsum Association for finish levels specified.

B. Fire-Test-Response Characteristics: Where indicated, provide assemblies tested for fire resistance per ASTM E119.

1. Fire Resistance Ratings:

a. GA File Numbers in GA-600 "Fire Resistance Design Manual"
b. UL "Fire Resistance Directory"
c. Other nationally recognized testing agency

C. Single-Source Responsibility:

1. Obtain each type of panel product from a single manufacturer.
2. Obtain finishing materials from or approved by the same manufacturer that supplies panel products.

D. Replace all board that has become wet at any point prior to the Date of Substantial Completion, including board that has been installed and finished.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover, dry, and protected against damage. Stack panels flat to prevent sagging.

B. Handle panels to prevent damage to edges, ends, and surfaces.

C. Do not bend or otherwise damage metal trim accessories.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 or with gypsum board manufacturer's recommendations, whichever is more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Ventilate building spaces as required for drying joint treatment. Avoid drafts during hot dry weather to prevent finishing materials from flash drying.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Custom Building Products
2. Fry Reglet

3. Georgia-Pacific Corp.
4. National Gypsum Co.
5. Pittcon Industries
6. United States Gypsum Company

2.2 GYPSUM BOARD PRODUCTS

A. Provide gypsum board of types indicated in maximum lengths available, minimizing joints.

1. Thickness: Provide gypsum board 5/8-inch thick to comply with ASTM C840 for application system and support spacing indicated.

B. Gypsum Wallboard: ASTM C1396 and as follows:

1. Type X. Mold resistant where indicated
2. Edges: Tapered

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047

1. Material: Sheet steel zinc-coated by hot-dip process
2. Shapes indicated below by reference to Fig. 1 designations in ASTM C1047:

a. Cornerbead on outside corners, unless otherwise indicated.
b. LC-bead (J-Bead) with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
d. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
e. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

2.4 JOINT TREATMENT MATERIALS

A. General: Complying with ASTM C475

B. Joint Tape for Panels: Paper

C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.

1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer for this purpose.

2.5 MISCELLANEOUS MATERIALS

A. Provide miscellaneous materials for gypsum board construction that comply with referenced standards and manufacturer’s recommendations.

B. Steel drill screws complying with ASTM C1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.03 inch thick.
2. Fastening gypsum board to gypsum board.

C. Steel drill screws complying with ASTM C954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Comply with ASTM C840.

1. Do not install imperfect, damaged, or damp panels.

B. Install wall/partition panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board.

C. Install gypsum panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge or end joints over supports. Do not place tapered edges against cut edges or ends. Avoid joints at corners of framed openings where possible.

E. Attach gypsum panels to framing provided at openings and cutouts.

F. Cover both faces of partition framing with gypsum panels in concealed spaces (i.e. above ceilings), except in chase walls that are braced internally.

1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4 to 3/8-inch wide joints to install sealant.

G. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4-inch to 1/2-inch wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.2 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application:

1. Partitions/walls: Apply gypsum panels vertically or horizontally. Use maximum length panels to minimize end joints.
2. Fastening Method: Steel drill screws

3.3 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges, fasten to framing with the same fasteners used for panels. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install corner beads (bullnose beads) at outside corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed or semi-exposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.

1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install L-bead where edge trims can only be installed after gypsum panels are installed.
3. Install U-bead where indicated.

D. Control Joints: Install per ASTM C840, and in locations approved by Architect for visual effect.

E. All trim, accessories and corner beads shall be installed using screws. “Crimping” tool and staple attachment is not allowed.

3.4 FINISHING GYPSUM BOARD ASSEMBLIES

A. Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints and to trim accessories with concealed face flanges as recommended by trim accessory manufacturer and as required to prevent cracks from developing in joint compound at flange edges.

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.

1. Level 4: For light textured finishes, wall coverings, and painted finishes.

3.5 CLEANING AND PROTECTION

A. Remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions to ensure gypsum board assemblies remain without damage or deterioration at the Date of Substantial Completion.

C. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 2900

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes acoustical ceilings and related items.

1.2 SUBMITTALS

A. Samples:

1. Manufacturer’s standard sample size for each panel type specified.
2. Manufacturer’s standard sample for grid showing all components in grid system.

B. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to that indicated for Project.

B. Fire Performance Characteristics:

1. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.

a. Flame Spread: 25 or less.
b. Smoke Developed: 50 or less.

2. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

C. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components, and partition system.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical ceiling units to avoid chipping edges or damaging units.

1.5 PROJECT CONDITIONS

A. Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above

ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 - PRODUCTS

2.1 CEILING TILE

A. Match existing. Review existing tile and submit sample for Architect's approval.

1. Retain existing tile being removed for reuse.

2.2 CEILING SUSPENSION SYSTEMS

A. Suspension systems shall meet or exceed the requirements of ASTM C 635 for dimensional tolerances, coatings and finishes, and load carrying capabilities.

B. Finishes and Colors: Match existing

C. Grid Face: Match existing

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Remove and retain ceiling tile that is in acceptable condition for reinstallation. Supplement with new tile as required for complete ceiling installation

1. Install new grid system where existing grid must be modified or extended to meet new construction. Include all necessary trims and other accessories.

C. Install acoustical tile in coordination with suspension system.

3.2 CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

C. Just prior to the Date of Substantial Completion, remove and replace skinned, damaged, or dirty tile with new as directed by Architect.

END OF SECTION 09 5100

SECTION 09 6519
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Luxury vinyl tile(LVT)
2. Resilient base

1.2 SUBMITTALS

A. Samples: Manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile and base indicated.

B. Results from Calcium Chloride Test and Bond and Moisture Test.

C. Installer Statement of Compliance: Certify flooring is installed in accordance with manufacturer’s installation instructions, including moisture test values, to validate manufacturer’s warranty.

D. Sample warranty

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain each type, color, and pattern from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

B. Contractor Qualifications:

1. Employ contractors skilled in the successful installation of the specified materials and accessories on similar projects for a minimum of five years.
2. Installing company shall employ a minimum of three qualified installers each with a minimum of two years experience installing VCT flooring.

C. Fire Performance Characteristics: Determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
2. Smoke Density: Less than 450 per ASTM E 662.
3. Flame Spread: Less than 75 per ASTM E 84.

D. Calcium Chloride Test: Measure moisture vapor emissions from the concrete slab on grade, prior to the installation of the resilient flooring. Maximum moisture emissions levels shall be as recommended by the resilient flooring manufacturer.

E. Bond and Moisture Tests: Conduct bond and moisture tests prior to installation. Bond and moisture tests shall be in accordance with manufacturer’s recommendations. Provide frequency of tests as recommended by manufacturer.

1. Test concrete slabs in accordance with ASTM F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete

Subfloor Using Anhydrous Calcium Chloride to ensure emission of no more than 3 lbs of water/1000 sf of slab in 24-hour period.

2. When test cannot be conducted under temperature and humidity conditions that will prevail under normal conditions, provide and maintain the 75 Deg F (+/- 5 Deg F) temperature and 50 percent (+/- 10 percent) humidity for 48 hours prior to and during the test.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in original unopened containers each bearing names of product and manufacturer, project identification, and shipping and handling instructions.

B. Store materials in dry spaces protected from the weather. Maintain ambient temperatures between 50 and 90 degrees F.

C. Store tiles on flat surfaces. Condition materials in spaces where they will be installed a minimum of 48 hours prior to installation.

1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 degrees F in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 degrees F.

B. Do not install tiles until they have been conditioned to the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.6 SEQUENCING AND SCHEDULING

A. Do not deliver or install products until building is enclosed, wet work completed, and HVAC system is operating and maintaining temperature and humidity at occupancy level during remainder of construction period.

B. Install tiles and accessories after other finishing operations, including painting, have been completed.

C. Do not begin installation until concrete slabs have cured, dry, and able to bond with adhesive as determined by manufacturer.

1.7 EXTRA MATERIALS

A. Furnish, not less than one box for each 50 boxes or fraction thereof, of each class, wearing surface, color, pattern and size of resilient floor tile installed.

1.8 WARRANTY

A. Manufacturer's Warranty: Standard warranty covering manufacturing defects and installation integrity: Installation integrity is defined as products installed in accordance with the manufacturer's installation manual.

1. Flooring: Five years minimum
2. Base: One year minimum

B. Installer's Warranty: Guarantee flooring and base installation against defects in installation, workmanship and loss of adhesion for one year.

C. Warranty period begins on the Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TILE AND ACCESSORIES

A. LVT: ASTM F1700, Class lll, Type B.

1. Thickness: Not less than 0.10 inches
2. Wear Layer Thickness: Not less than 20 mil
3. Maximum static load must exceed 900 PSI
4. Refer to Finish Schedules on Drawings for basis of design or other as approved by Architect.

2.2 RESILIENT BASE

A. Vinyl Cove Base: 4 inches in height by roll stock and 1/8-inch thick, ribbed back, rounded top, and set on type. (4 foot length base material is not acceptable.) Refer to Finish Schedules on Drawings for basis of design or other as approved by Architect.

1. Provide molded corners 4 inches in height by 4 inches in length each way for internal and external corners.

2.3 MISCELLANEOUS MATERIALS

A. Adhesive: Recommended by manufacturer

B. Subfloor Filler: Portland cement-based latex underlayment; type recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where installation of tiles will occur. Do not proceed until unsatisfactory conditions have been corrected.

B. Concrete Subfloors: Verify concrete slabs comply with ASTM F 710 and the following:

1. Dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Division 03 Section, Cast-In-Place Concrete for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
4. Provide a 100 percent solids epoxy membrane over concrete substrates that do not meet the required moisture vapor transmission rate, as recommended by flooring manufacturer to maintain warranty conditions.

3.2 PREPARATION

A. Comply with manufacturer's installation specifications to prepare substrates to receive tile.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom and vacuum substrates immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. Comply with tile manufacturer's installation directions and other requirements indicated applicable to each type of tile installation scheduled.

B. Lay out tile from center marks established with principal walls so tiles at opposite edges of room are of equal width. Adjust to avoid using widths less than half of a tile. Install tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern with respect to location of colors, patterns, and sizes as indicated on Drawings.

D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.

H. Set tile to substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions for trowel notching, adhesive mixing, and adhesive open and working times. Spray applied adhesives are not allowed.

J. Hand roll tiles where required by tile manufacturer.

3.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

G. Job-Formed Corners: Not allowed

3.5 CLEANING AND PROTECTION FOR LVT

A. Sweep, dust mop or vacuum the floor thoroughly to remove all loose dust, dirt, grit and debris.

B. Remove any dried adhesive residue with a clean, white cloth dampened with mineral spirits, carefully following the warnings on the container.

C. Damp mop the floor with a properly diluted neutral (pH 6 to 8) detergent solution.

D. If necessary, scrub the floor using a rotary machine or auto scrubber with a properly diluted neutral detergent solution and the appropriate scrubbing brush (aggressiveness equivalent to 3M red pad for light scrub, 3M blue pad or equal for a deep scrub).

E. Thoroughly rinse the entire floor with fresh, clean water. Remove rinse water and allow the floor to dry completely.

F. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

G. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.

END OF SECTION 09 6519

SECTION 09 6813
CARPET TILE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes carpet tile and accessories

1.2 SUBMITTALS

A. Product Data:

1. Printed data sheets for each type of carpet and accessory specified
2. Installation system proposed
3. Care, cleaning, and maintenance information. Include two copies of each of the following CRI publications:

   a. “Steps in the right direction, an Owners Manual for Your Carpet” with pertinent treatment highlighted
   b. Carpet Maintenance Guidelines for Commercial Applications
   c. Take a Deep Breath and Thank Your Custodian; Tips and Tools for Improving IAQ in Schools

4. Smoke and flammability reports

B. Maintenance training video

C. Samples:

1. Manufacturers standard color books of actual samples
2. Manufacturers standard trim chain
3. Three full size samples of each carpet tile pattern submitted
4. Three 12-inch long strips of each trim unit submitted

D. Certifications and Testing:

1. Provide certification that tile has been manufactured in accordance with the Contract Documents.
2. Traffic Appearance Retention Rating (TARR) documentation
3. Test results of the Bond and Moisture tests
4. Test results from the Calcium Chloride tests

E. Sample Warranty

1.3 QUALITY ASSURANCE

A. Commitment to Sustainability: Carpet manufacturer shall have an operational carpet-recycling program for 100 percent of the new carpet product (at the end of its useful life). This program shall not consist of incineration.

B. Contractor’s Qualifications:

1. Employ only experienced installers, skilled in installation of the specified systems.
2. Installation company shall employ a minimum of three qualified installers with a minimum of three years experience each of installing similar systems.

C. Manufacturer's Qualifications:

1. Employ only manufacturers making the specified materials as a current production item.
2. Manufacturers shall have a minimum of five years of production experience with carpet of similar types to that specified.

D. Source Limitations: Obtain carpet from a single source, unless otherwise directed by Architect.

E. Install carpet after building is enclosed, wet work complete, and HVAC system operational.

1. Maintain temperature and humidity at designed level for the remainder of the construction period.

F. Carpeting shall have a minimum critical radiant flux of 0.45 watts per square centimeter (radiant panel test) per ASTM E648 "Standard Test Methods for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source."

G. Carpeting shall meet a minimum TARR rating 3.0 for Heavy Traffic

H. Carpet Fire-Test-Response Characteristics: Provide carpeting with the following characteristics as determined by testing identical products per test method indicated below by U.L. or another nationally recognized testing laboratory acceptable to the authorities having jurisdiction. Identify carpet with appropriate markings of applicable agency.

1.	Surface Flammability:	Passes CPSC 16 CFR, Part 1630
2.	Flam Spread	25 or less per ASTM E 84
3.	Smoke Density:	450 or less per ASTM E 84
4.	Static:	Under 3.5 kv. Below the average level of human sensitivity

I. Adhesives: VOC levels shall comply with Division 07 Section, Joint Protection.

J. Carpet shall have been tested against and passed the CRI Green Label Plus Program.

K. Calcium Chloride Test: Measure moisture vapor emissions from concrete slab prior to the installation of the carpeting. Maximum moisture emissions levels shall be as recommended by the carpeting manufacturer.

L. Bond and Moisture Tests: Provide bond and moisture tests prior to the installation of the carpet. Tests shall be in accordance with the carpet manufacturer's recommendations. Provide amount of tests as recommended by the carpet manufacturer.

M. The Architect may send samples of materials, taken at random from the jobsite, to an independent testing laboratory. The cost of testing shall be borne by the contractor if the material is found non compliant with specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in the original factory packaging, labeled with identification of manufacturer, brand name, lot number, and test data.

B. Store materials on site, in original packaging, inside a well ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity.

1.5 PROJECT CONDITIONS

A. Dimensions on Drawings are approximate. Field verify dimensions and other conditions affecting Work.

1.6 EXTRA STOCK

A. Two percent of the amount installed for each carpet type.

1.7 WARRANTIES

A. Manufacturer's Warranty:

1. Warranty shall be non-prorated against surface pile wear, zippering, edge ravel, excessive static, loss of resiliency, tough bind, moisture barrier (passes British Spill Test), and delamination of secondary backing.
2. Surface pile wear for warranty purposes shall be no more than 10% loss of face fiber.
3. Warranty shall be for a minimum of twenty years.

B. Installer's Warranty: Guarantee the installation against defects in workmanship, seaming, and loss of adhesion for a period of three years.

C. Warranties shall begin on the date of Substantial Completion.

D. Upon written notice from the Architect, correct or replace improper work and material that may become apparent within the warranty period. Repairs will be made in accordance with this specification.

1. Exception: Any problems arising from improper adherence to the manufacturer's recommended maintenance program.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carpet by Architect. Refer to Finish Schedules on Drawings for basis of design or other as approved by Architect.

2.2 MATERIALS

A. Match Architect's sample

B. Carpet shall have been tested against and passed the Indoor Air Quality Carpet Testing Program requirements of CRI.

C. Nylon: All nylon fiber shall be solution dyed branded type 6,6 from DuPont, or Solutia.

D. Product Specifications:

1.	Construction:	Tufted Textured Loop. Tile will exhibit varying loop heights on face
2.	Gage:	1/12 minimum
3.	Face Weight:	Minimum 22 ounce, plus or minus 2 ounces per square yard

4.	Size	50 cm x 50 cm
5.	Density	6000 ounces per cubic yard minimum
6.	Flammability	Passes, Pill Test (ASTM D2859 or CPSC FF-1-70)
7.	Smoke Density	≤ 450 Flaming Mode (ASTM E662)
8.	Dimensional Stability	≤ 0.1% change Stability (Aachen Method Din 54318)
9.	Static Generation	≤ 2.5 kV at 20% R.H. at 70º F (AATCC 134 w/ neolite)
10.	Lightfastness	4.0 after 60 hours (AATCC 16E)
11.	Cold Water Bleed	4.0 (AATCC 107)
12.	Formaldehyde or 4-PC	Not allowed

13. Antimicrobial: Broad spectrum antimicrobial; permanent application in backing. Application must pass AATCC-174

E. Vinyl Carpet Trims: Basis of Design is products by Johnson Rubber Co. Colors as selected by Architect. Provide edge type as follows:

1. Transition between 1/8 inch resilient and 1/4 inch carpet to encapsulate both cut edges. CTA-XX-A. Adjust part number in CTA series for actual carpet thickness.
2. Transition from 1/4 inch thick carpet to substrate. CTA-XX-J. Adjust part number in CTA series for actual carpet thickness.
3. Transitions by other manufacturers are also acceptable as approved by Architect

F. Adhesive:

1. Releasable pressure sensitive type as recommended by the carpet manufacturer which will allow removal of carpet tile at any time without damage or adherence to carpet.

2. Adhesive must contain antimicrobial preservative; have “zero” calculated VOC’s and be on “greenlist.”

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Examine substrate for compliance with the Contract Documents. Do not proceed until unsatisfactory conditions have been corrected.

B. Remove subfloor coatings, including curing compounds, dust, dirt, solvents, soaps, silicone, wax, oil, grease, paint, plaster, and other substances that are incompatible with adhesives. Allow floors to dry. Apply sealer to prevent dusting.

C. Ensure concrete floors are free from cracks, ridges, depressions, scaling and irregularities.

D. Ensure constant floor height after installation with a maximum variation of 1/4-inch per 10 feet non-cumulative in any direction.

3.2 INSTALLATION

A. Install carpet system in accordance with manufacturer’s recommendations.

1. Carpet coverage shall be complete to edges of space and free of gaps between tiles and at bases of permanent fixtures within designated areas.
2. Install using direct glue-down method. Comply with CRI 104, Section 8, Direct Glue-Down Installation

B. Check matching of carpet before cutting and ensure no visible variation between dye lots.

C. Cut carpet in a manner to allow proper seam and pattern match. Ensure cuts are straight, true, and not frayed.

D. Adhesive: Prime substrate as recommended by adhesive manufacturer. Spread adhesive at stipulated rates for full adhesion.

E. Install trims where carpet terminates at other floor coverings. Use full-length pieces only. Where splicing cannot be avoided, butt ends tight and flush.

F. Install tile to be free of air pockets.

G. Do not place heavy objects such as furniture on carpeted areas for a minimum of 24-Hours after completed installation or until adhesive is set.

H. Separate waste in accordance with the Waste Management Plan. Manufacturer to reclaim all scrap not retained by Owner.

3.3 CLEANING AND PROTECTION

A. All scrap carpet shall be palletized and returned to the manufacturer.

B. Immediately after installation, remove visible cement, dirt, wrappings, cartons, clippings, and other foreign substances. Vacuum carpet.

C. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and installer until the Date of Substantial Completion.

D. Conduct an instruction class for the Owner’s maintenance staff prior to the Date of Substantial Completion.

1. Instruct personnel on the proper method of cleaning the material as recommended by the manufacturer.
2. Videotape this session.

END OF SECTION 09 6813

SECTION 09 9000
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes painting and finishing work.

B. The Architect shall not be limited in the number of colors selected for single space or for the complete Project.

1.2 DEFINITIONS

A. The terms “paint”, “protective coating”, etc. include paints, special coatings, stains, sealers, fillers, and other types of coatings and coating materials whether used as primers, barrier, intermediate, or finish coats individually or as a system.

B. Exposed Surfaces: Surfaces exposed to view when permanent or built-in fixtures, covers, grilles, mechanical and electrical equipment housings, ducts and conduits, are in place; surfaces in back of movable equipment and furniture; and interior surfaces of ducts visible through grilles, interior surfaces visible through equipment covers, and blank-off panels.

1.3 SUBMITTALS

A. Materials List: An inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

1. Prepare coating systems schedule proposed on the basis of the surfaces, types of materials, and their dry film thickness. List the name and product number for the products proposed for each use.
2. This shall in no way be construed as permitting substitution of materials for those specified or approved for this Work by the Architect.
3. Provide a list of coating systems for all existing surfaces to be re-coated.

B. Color Chip Catalog: Provide Architect with a complete current color chip catalog from which colors may be selected. Manufacturers may fulfill this requirement by updating catalog that Architect may presently have in his possession.

C. Draw Downs: Two 9 x 9 inch samples of each selected color and texture.

D. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable manufacturer in this Section of these Specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

1. Manufacturer Inspection report showing the substrate has been reviewed; is properly prepared, and compatible for the scheduled coating system.

E. Field sample

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

B. Single Source Responsibility: Provide primers and undercoat materials produced by the same manufacturer as the finish coats.

1. Do not mix products from differing manufacturers unless specifically permitted and accepted in writing by the involved manufacturers. Such acceptance shall not affect printed recommendations or warranties. Provide such acceptances prior to commencing work.

C. Material Quality: Provide the manufacturer's best quality materials of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be accepted.

D. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

E. Codes and Standards: In addition to complying with pertinent codes and regulations, comply with the Painting and Decorating Contractors of America (PDCA) in their "PDCA Industry Standards" unless more stringent requirements are specified in the Contract Documents.

F. Field Samples:

1. Provide a complete room field sample illustrating coating color, texture, and finish.
2. Locate where directed by Architect and Owner.
3. Accepted sample may remain as part of the work.

G. Environmental Requirements:

1. VOC emissions from architectural paints and coatings shall not exceed the VOC and chemical component limits of Green Seal Standard GS-11 requirements.

a. Non-flat 150 g/l
b. Flat 50 g/l

2. Paints shall be manufactured without the use of any formaldehyde precursors.

1.5 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Provide adequate lighting during the application of any coating system, minimum level shall be that level that will be required for the intended use of the space.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint materials to the job site in their original unopened containers with labels intact and legible at time of use.

B. Store materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area.

1. Provide a 10B:C fire extinguisher in the immediate vicinity of the storage area.
2. Store only the approved materials at the job site and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
3. Use means necessary to ensure the safe storage and use of paint materials and the safe disposal of waste.

1.7 EXTRA STOCK

A. Deliver to the Owner 1 gallon of extra stock of each type, color, and gloss of material used. Deliver sufficient unmixed proportions of multi component materials to make minimum 1 gallon of each.

B. Furnish extra paint materials from the same production run as the materials applied in the Work. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents including location of application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products specified are those known suitable for this type of work and are based on products shown on the schedules at the end of this section and require no further approval as to manufacturer or catalog number.

1. Substitution requests shall include manufacturer's literature for each proposed product giving the name, generic type, descriptive characteristics, and independent testing laboratory certification for meeting or exceeding characteristics as listed on data sheets from the design basis products. Systems subject to Architect's approval.
2. Substitute products shall be the highest quality grade of the various types of materials regularly manufactured by the manufacturer for indicated substrates. Substitute products may have to be a different generic type to provide performance comparable to that specified. Materials not displaying the manufacturer's identification as the highest-grade product, or not recommended by the manufacturer's lab as the best and most suitable product will not be accepted.
3. Substitutions which propose decrease the film thickness or fail to meet any of the performance or other characteristics of the design basis materials will not be considered.

B. Other Acceptable Manufacturers:

1. Benjamin Moore & Company
2. Glidden Professional
3. PPG Paints
4. Sherwin-Williams

2.2 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings. Prepare pigments:

1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating
2. For good flow and brushing properties
3. Capable of drying or curing free of streaks or sags
4. Interior materials furnished shall produce a surface having a Class A rating for flame, fuel, and smoke.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.

C. Material Compatibility: Provide primers, finish coat materials, equipment, and related materials that are compatible with one another and the substrates and existing coatings indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

1. Coordinate primed or pre-finished products recommended by manufacturer, assuring compatibility of the total systems.
2. Provide barrier material over suspected noncompatible substrates as recommended by coatings manufacturer. If performance of specified finish system will be compromised due to incompatibility, remove the noncompatible finishes and re-prime. Barrier coat, removal and re-priming to be at no additional cost to Owner.
3. Thinners shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.

D. Materials not specifically indicated but required for preparation, application, or clean-up shall be of high grade commercial quality.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which painting work is to be applied, including coating compatibility at existing surfaces. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Examine and test each existing surface to be recoated and provide a recommended coating system based on field testing findings.

B. Starting of painting work will be constructed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint surface.

D. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

E. Test shop applied primers for compatibility with subsequent cover materials.

F. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

3.2 SURFACE PREPARATION

A. General

1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions, and as specified, for each substrate condition.
2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place prior to surface preparation and painting operations. Following completion of painting of each space or area, reinstall removed items.

    a. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

3. Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning. Program cleaning and painting so that contaminates from cleaning process will not fall onto wet, newly painted surfaces.

    a. Remove mildew by scrubbing with solution of tri-sodium phosphate, water and bleach unless more stringent requirements are required by the manufacturer.
    b. Paint the entire existing wall from intersection to intersection, floor to ceiling, where any renovation work has occurred (example: removal or installation of doors or windows within an existing wall).

B. Provide barrier coats over incompatible primers or remove and re-prime.

1. Shellac and spot prime with industry accepted “stain killers” at all marks or stains which may bleed through final finishes.

C. Before applying succeeding coats, primers and undercoats shall be integral and shall function as intended. Touch up all scratches, abrasions and other disfigurements and remove any foreign mater before proceeding with the following coat. All spot-priming or spot-coating shall be feathered into adjacent surfaces for a smooth final surface.

D. Do not apply final coats until other work with operations that would be detrimental to finish coats has been completed in that area.

E. When the manufacturing of paint supplied does not require or recommend a primer, and a single coat will provide required coverage, approval from the Architect must be obtained to delete second coat; and a credit shall be due the Owner.

F. Shop Primed Steel and Iron Surfaces: Areas that have had shop prime coat damaged are to be re-prepared by receiving a power tool cleaning (SSPC SP-3), or abrasive blast cleaning (SSPC SP-6) for the respective surface and coating involved. Feather edges to make touch-up patches inconspicuous.

G. Wood Surfaces: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Seal knots, pitch streaks

and sappy sections. Fill nail holes and other indentations with putty, flush with adjacent surfaces after primer has dried. Sand wood surfaces smooth with 100 grit sandpaper and remove dust.

1. Treat surfaces of open-grained woods with paste filler. Thin paste filler to brushing consistency and apply in two coats, with stiff, short-bristled brush. Allow filler to dry. Rub surface across the grain with coarse burlap or 3-M pads until the surplus filler is removed.
2. Scrape and clean small, dry, seasoned knots and apply a thin coat of shellac or other recommended knot sealer before application of primer. Sand smooth when dried.
3. Prime, stain, or seal wood to be painted immediately upon delivery.
    a. Do not allow wood to weather more than three days (72 hours) before priming. If three days have passed, wood surface must be scrub sanded with 80 and 100 grits.
    b. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
4. When transparent finish is required, backprime with spar varnish.

H. Gypsum Board Surfaces:

1. Fill minor defects with filler compound and spot prime defects after repair.
2. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Finish smooth and flush with adjacent surfaces.
3. Do not begin paint application until finishing compound is dry and sanded smooth.

I. Non-Compatible Finishes: Materials or equipment with non-compatible factory finishes shall receive an application of an intermediate or barrier material as required by the manufacturer of finish product. If performance of specified finish system will be compromised due to incompatibility, Architect reserves the right to require removal of factory primer or finish, and application of a new compatible primer. Additional work and materials required by non-compatible finishes shall be provided at no additional cost to Owner.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's written instructions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
2. Apply material only to clean, dry surfaces and during periods of favorable weather unless otherwise allowed by the manufacturer.
3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
4. Paint front and back sides of access panels and removable or hinged covers to match exposed surfaces.
5. Seal top and bottom edges of wood doors with two coats of shellac or other effective sealer immediately upon delivery of doors to Site and after trimming to size.
6. Sand lightly between each succeeding enamel or varnish coat.

B. Use a tack rag to tack off all gypsum walls prior to priming.

C. Brush or roll out and work materials onto surfaces in an even film, free of marks.

D. Spray Application: Utilize spray application on metal surfaces where hand brush work would be inferior.

1. Each application shall provide the equivalent hiding of brush-applications. Do not double back with spray equipment for the purpose of building up film thickness in one pass.
2. Backroll all applications on stucco surfaces.

E. Make each application to provide a uniform finish, distinctively darker than the proceeding. Make edges adjoining other materials or colors sharp and clean, without overlapping. Sand between applications with fine sandpaper or rub surfaces with pumice stone in accordance with manufacturer's directions, where required to produce a smooth even finish.

F. Scheduling Painting: Apply first coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
2. Slightly vary the color of succeeding coats.

G. Paint Film Thickness: Make as many applications of material as necessary to obtain the minimum dry film thickness recommended by the manufacturer. Rate of application shall not exceed manufacturer's recommendations for each coat.

H. Prime Coats: Apply prime coat of material which is required to be painted or finished and which has not been prime coated by others.

1. Recoat primed and sealed surfaces where there is evidence of suction

spots or unsealed areas in first coat, to assure a finish coat with no burn through or other defects due to insufficient sealing.

2. Coordinate manufacturer's prime coats with finish coats as specified herein. If compatibility is not ascertained during the bidding period, and verification submitted with the shop drawings, then prime coat paint system as specified herein shall be applied to the item prior to finish painting as specified herein.

I. Pigmented Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

1. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Paint shop primed equipment. Paint shop finished items when shop finish is damaged. Galvanized items are not considered pre-finished and are to be painted when visible (outside mechanical/electrical closets).

B. Prime and paint insulated and non-insulated pipes, conduit, boxes, insulated and non-insulated ducts, hangers, brackets, collars and supports exposed to view.

C. Prime and paint exposed to view mechanical and electrical equipment occurring in finished areas, in addition to manufacturers paint finish if any.

1. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
2. Refer to Mechanical and Electrical Sections for schedule(s) of stencil identification and banding for equipment, ductwork, piping, and conduit in accordance with ANSI requirements. Consult Architect for resolution of color or identification conflicts.

D. Paint both sides and edges of plywood backboards for electrical and telephone equipment with fire-retardant finish before installing backboards or equipment.

3.6 FIELD QUALITY CONTROL

A. Work is subject to inspection by the Architect, Owner, or their representative(s) at any time.

1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Site will be taken, identified, sealed, and certified in presence of Contractor.

B. The coating thickness shall be determined by the use of a properly calibrated "Nordson-Microtest" or "Elcometer" dry film thickness gage, or "Tooke gage". Keep one of these instruments on the Site with calibration equipment, for field quality control purposes and for use by the Architect, Owner, or their representative(s). Use selected instrument frequently to maintain proper control on film thickness.

C. Refinish whole wall where portion of finish has been damaged or is not acceptable.

3.7 CLEAN-UP AND PROTECTION

A. Remove from Site discarded paint materials, rubbish, cans, and rags at end of each work day.

B. Upon completion of painting work clean window glass and other paint- spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition. Provide "Wet Paint" signs as required to protect newly painted finishes.

D. At the completion of Work of other trades, touch-up and restore damaged or defaced painted surfaces.

3.8 PAINT TYPES AND NUMBER OF COATS

A. The following schedules are intended to identify the type of finishes which are required for the various surfaces, and to identify the surfaces to which each finish is to be applied.

1. Where the substrate has a compatible and satisfactory prime coat already on it, the prime coat specified for the numbered finish may be omitted. Test prime coat for compatibility before applying additional coats.
2. When the manufacturing of paint supplied does not require or recommend a primer, and a single coat will provide required coverage, approval from the Architect must be obtained to delete second coat; with a credit.

B. To define requirements for quality, function, and textures, the following list of materials designates the manufacturer's brand, types, and other requirements to conform to the requirements of this Project.

3.9 INTERIOR PAINTING SCHEDULE

A. All surfaces: touch-up at construction points. Determine existing coating system and submit recommendations for approval.

B. Gypsum Board:

1. Acrylic-Latex Finish:

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer.

1) Sherwin-Williams: Vapor Barrier Primer 154-6407
2) Glidden Professional: Vapor Barrier Primer-Sealer (1060)
3) Benjamin Moore Super Spec Vapor Barrier Primer 260

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel

applied at spreading rate recommended by the manufacturer.

1) Sherwin-Williams: ProMar 200 Latex Semi-Gloss B31W200
2) Glidden Professional: ULTRA-HIDE 150 Latex Semi-Gloss (1416v)
3) Benjamin Moore Ultra Spec 500 Semi-Gloss N539

c. Surfaces: Gypsum board walls, bulkheads.
d. First and Second Ceiling Coats: Flat, acrylic-latex, applied at spreading rate recommended by the manufacturer

1) Sherwin-Williams: Super Save Lite Dryfall Flat B47/B48 Series
2) Glidden Professional: Waterborne Dry Fall Flat (1280)
3) Benjamin Moore SuperKote 5000 Dryfall Flat (N110)

C. Painted Wood:

1. Acrylic-Latex Finish:

a. Primer Coat: Applied at spreading rate recommended by the manufacturer.

1) Sherwin-Williams: PrepRite Classic Latex Primer
2) Glidden Professional: Gripper Interior/Exterior Primer Sealer (3210)
3) Benjamin Moore Fresh Start Superior 046
4) PPG Paints 17-955 SEAL GRIP® Interior Latex Enamel Undercoater

b. First and Second Finish Coats: Semigloss, acrylic-latex interior enamel applied at spreading rate recommended by the manufacturer.

1) Sherwin-Williams: ProMar 200 Interior Latex Semi-Gloss
2) Glidden Professional: ULTRA-HIDE 150 Interior Latex Semi-Gloss (1416)
3) Benjamin Moore Ultra Spec 500 Semi-Gloss N539
4) PPG Paints 6-500 Series SpeedHide® Interior Semi-gloss Acrylic

D. Electrical Equipment Backer Boards:

1. Fire Retardant Coating: Flame Control No. 20-20 flat Intumescent Fire Retardant Paint

E. Ferrous Metal:

1. Acrylic Enamel:

a. Primer: Metal primer applied at spreading rate recommended by the manufacturer.

1) Sherwin-Williams: All Surface Enamel Latex Primer
2) Glidden Professional: DEVFLEX 4020PF DTM Primer

3) Benjamin Moore — Acrlyic Metal Primer P04
4) PPG Paints — 90-912 Series Pitt-Tech Plus Int/Ext Industrial DTM Primer/Finish Enamel

b. Second and Third Coats: Gloss, applied at spreading rate recommended by the manufacturer.

1) Sherwin-Williams: — Proclassic Waterborne Acrylic Gloss, B21 Series
2) Glidden Professional — DEVFLEX 4208QD Interior/Exterior Waterborne Gloss (4208)
3) Benjamin Moore — DTM Acrylic Gloss P28
4) PPG Paints — 6-8534 Series SpeedHide® Interior 100% Acrylic Latex Gloss

c. Surfaces: Hollow metal doors and frames, and miscellaneous steel, where scheduled, noted to be painted, or exposed to view.

END OF SECTION 09 9000

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Fire-suppression equipment and piping demolition.
   3. Equipment installation requirements common to equipment sections.
   4. Painting and finishing.
   5. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

1.4 SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise. Refer to architectural plans for additional installation requirements.

E. Install inspector test drains and auxiliary drains lines to empty into the site storm sewer system. Route discharge piping underground to connect to nearby storm inlet.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping to permit valve servicing.

H. Install piping at indicated slopes.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install piping to allow application of insulation.

L. Select system components with pressure rating equal to or greater than system operating pressure.

M. Verify final equipment locations for roughing-in.

N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PAINTING

A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Section "Interior Painting".

B. As part of the work of this Section, all exposed piping and/or equipment shall be painted with two coats of epoxy paint unless specified to be painted in the Division 09 Section mentioned above.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

C. Field Welding: Comply with AWS D1.1.

END OF SECTION 21 05 00

SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipes, fittings, and specialties.
   2. Sprinklers.
   3. Scope of Work:

      a. The scope of work of this project shall include providing sprinklers, piping, supports, and equipment to maintain a complete wet-pipe fire sprinkler system for the renovated areas as shown on the plans and in accordance with applicable code requirements. Any additional sprinklers, piping or equipment required to meet code requirements, in the CONTRACTOR'S opinion, shall be included in this work.
      b. Provide layout design services as required per applicable State regulations.
      c. Utilize the existing fire sprinkler system as required.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

1.4 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.5 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig (1200-kPa) minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified Installer.

D. Welding certificates.

E. Fire-hydrant flow test report.

F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

G. Field quality-control reports.

H. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
      a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Malleable- or Ductile-Iron Unions: UL 860.

C. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick.
   1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
   2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:
   1. Valves shall be UL listed or FM approved.
   2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig (1200 kPa).

B. Bronze OS&Y Gate Valves:
   1. Manufacturers: Subject to compliance with requirements:
      a. Crane Co.; Crane Valve Group; Crane Valves.
      b. Milwaukee Valve Company.
      c. NIBCO INC.
   2. Standard: UL 262.
   3. Pressure Rating: 175 psig (1200 kPa).
   4. Body Material: Bronze.
   5. End Connections: Threaded.

2.5 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements:
   1. Reliable Automatic Sprinkler Co., Inc.
   2. Tyco Fire & Building Products LP.
   3. Victaulic Company.
   4. Viking Corporation.

B. General Requirements:
   1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
   2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Sprinklers:
   1. Concealed recessed head standard coverage quick response pendent.

D. Sprinkler Finishes:
   1. Bronze.

E. Special Coatings:
   1. None

F. Sprinkler Covers: Materials, types, and finishes for the following sprinkler mounting applications. Covers for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
   1. Ceiling Mounting: White painted steel, one piece, flat; mounted flush to the ceiling tile.
   2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
   1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes NPS 2 and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

F. Install sprinkler piping with drains for complete system drainage.

G. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

H. Pressurize and check sprinkler system piping.

I. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. Install listed fire-protection valves, trim and drain valves according to NFPA 13 and authorities having jurisdiction.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Install concealed type sprinkler covers flush with the acoustical ceiling panels.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
   3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
   4. Energize circuits to electrical equipment and devices.
   5. Coordinate with fire-alarm tests. Operate as required.
   6. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 PIPING SCHEDULE

A. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:
   1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
   2. Standard-weight, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
   3. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.9 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:
   1. Rooms with Suspended Ceilings: Concealed sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.
   1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.

END OF SECTION 21 13 13

SECTION 23 05 00 - COMMON WORK RESULTS FOR MECHANICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mechanical equipment coordination and installation.
2. Common mechanical installation requirements.
3. Commissioning requirements.

1.3 GENERAL REQUIREMENTS

A. Carefully examine General Conditions, other specification sections, and other drawings (in addition to DIVISION 23), in order to be fully acquainted with their effect on mechanical work. Additions to the contract cost will not be allowed due to failure to inspect existing conditions.

B. Do all work in compliance with 2014 Florida Mechanical Code, 2014 Florida Building Code, and the Codes adopted therein, 2014 Florida Fire Prevention Code. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like, and deliver such certificates to the Architect/Engineer.

C. Cooperate and coordinate with all other trades. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the condition of the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by mechanical workmen.

D. Furnish, perform, or otherwise provide all labor (including, but not limited to, all planning, purchasing, transporting, rigging, hoisting, storing, installing, testing, chasing, channeling, cutting, trenching, excavating and backfilling), coordination, field verification, equipment installation, support, and safety, supplies, and materials necessary for the correct installation of complete and functional mechanical systems (as described or implied by these specifications and the applicable drawings).

1.4 DRAWINGS:

A. Indicate only diagrammatically the extent, general character, and approximate location of work. Where work is indicated, but with minor details omitted, furnish and install it complete and so as to perform its intended functions.

B. DIVISION 23 work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the

work. This shall include roughing-in for connections and equipment as called for or inferred. This would include connection and ductwork required for all fans, hoods, dryers, diffusers etc as required for a functional installation, whether shown on the drawings or not. Check all drawings and specifications for the project and shall be responsible for the installation of all DIVISION 23 work.

C. Take finish dimensions at the job site in preference to scale dimensions. Do not scale drawings where specific details and dimensions for DIVISION 23 work are not shown on the drawings, take measurements and make layouts as required for the proper installation of the work and coordination with all drawings and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect/ Engineer, and no additional costs shall be allowed to the base contract price.

D. Carefully check the drawings and specifications of all trades and divisions before installing any of the work. Contractor shall in all cases consider the work of all other trades, and shall coordinate his work with them so that the best arrangements of all equipment, piping, conduit, ducts, rough-in, etc., can be obtained. The avoidance of any beams, joist or bracing that is an obstruction to ductwork, shall be included in the bid. This includes the reroute of ductwork or dimension revisions required to obtain the intended function of the ductwork. Bring all obstructions to the attention of the A/E during the shop drawing preparation and prior to fabrication of any ductwork. No cost will be paid by the owner for these modifications that can be identified by reviewing all sets of drawings prior to bid.

E. Provide appropriately rated fire dampers or fire/smoke dampers as required by code at penetrations of fire rated or smoke rated walls by all duct work including but not limited to air supply, return, exhaust and ventilation ducts. These shall be provided at no additional cost whether shown on the drawings or not.

F. Provide louvers in generator rooms for the generator whether shown or not. Louver shall be sized for appropriate combustion and cooling required per the manufacturers literature. Include all exhaust piping to take exhaust from muffler to the building exterior and fuel vent to the exterior whether shown or not.

G. Coordinate mechanical equipment voltage requirements with electrical drawings. Notify the A/E of any discrepancies prior to bid. Make all revisions required to coordinate with no additional cost to the owner.

H. Obtain manufacturer's data on all equipment, the dimensions of which may affect mechanical work. Use this data to coordinate proper service characteristics, entry locations, etc., and to ensure minimum clearances are maintained.

1.5 QUALIFICATIONS OF CONTRACTOR:

A. DIVISION 23 Contractor shall have had experience of at least the same size and scope as this project, on at least two other projects within the last five years in order to be qualified to bid this project.

B. Contractor performing any part of this scope of work shall be a Florida State Certified Mechanical Contractor (Type CMC)

C. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable size and complexity. Superintendent shall be on the site at all times during construction.

1.6 SITE VISIT/CONDITIONS

A. Visit the site of this contract and thoroughly familiarize with all existing field conditions and the proposed work as described or implied by the contract documents. During the course of his site visit, verify every aspect of the proposed work and the existing field conditions in the areas of construction which might affect his work. No compensation or reimbursement for additional expenses incurred due to failure or neglect to make a thorough investigation of the contract documents and the existing site conditions will be permitted.

B. Install all equipment so that all Code required and Manufacturer recommended servicing clearances are maintained. Coordinate the proper arrangement and installation of all equipment within any designated space. If it is determined that a departure from the Contract Documents is necessary, submit to the A/E, for approval, detailed drawings of the proposed changes with written reasons for the changes. No changes shall be implemented without the approval of the engineer.

C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.

D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Field verify dimensions of all site conditions prior to bidding and include any deviations in the contract. Notify A/E if deviations are found.

E. All existing mechanical is not shown. Become familiar with all existing conditions prior to bidding, and include in the bid the removal of all mechanical equipment, duct, controls wiring, control devices, and control conduits, etc. that is not being reused, back to it's originating point.

F. Locate all existing utilities and protect them from damage. Pay for repair or replacement of utilities or other property damaged by operations in conjunction with the completion of this work.

G. Work is in connection with existing buildings which must remain in operation while work is being performed. Work shall be in accord with the schedule required by the Contract. Schedule work for a minimum shut down to Owner. Notify Owner 72 hours in advance of any shut-down of existing systems. Perform work during non-operating hours unless otherwise accepted by Owner. Protect existing buildings and equipment during construction.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR MECHANICAL INSTALLATION

A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both mechanical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

E. All work shall be executed in a workmanship manner and shall present a neat mechanical appearance upon completion.

F. Care shall be exercised that all items are plumb, straight, level.

G. Care shall be exercised so that Code clearance is allowed for all panels, controls. etc., requiring it. Do not allow other trades to infringe on this clearance.

H. The electrical circuits, components and controls for all equipment are selected and sized based on the equipment specified. If substitutions are proposed, furnish all materials and data required to prove equivalence. No additional charges shall be allowed if additional materials, labor, connections or equipment are needed for substituted products. Any modifications to the electrical design and installation or other trades will also need to be made at no additional cost to the Owner to accommodate the proposed substitutions. Comply with division 1 “substitutions” if allowable.

END OF SECTION 23 05 00

SECTION 23 05 10 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical demolition.
5. Equipment installation requirements common to equipment sections.
6. Painting and finishing.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

END OF SECTION 23 05 10

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Duct labels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Per section 3.4.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 4 by 2-4 inch.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 DUCT LABEL INSTALLATION

A. Install duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
3. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 23 05 53

SECTION 23 05 93- TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

a. Constant-volume air systems.

2. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

E. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

F. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

G. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

H. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

I. Report Forms: Test data sheets for recording test data in logical order.

J. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

K. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

L. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

M. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

N. TAB: Testing, adjusting, and balancing.

O. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

P. Test: A procedure to determine quantitative performance of systems or equipment.

Q. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 2 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit **6** copies of the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days from Contractor's Notice to Proceed, submit 2 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

E. Sample Report Forms: Submit two sets of sample TAB report forms.

F. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 PROJECT CONDITIONS

A. Owner Occupancy: Owner will not occupy the building during entire TAB period. T&B reports shall be finalized and approved prior to owner occupancy.

B. T&B firm shall be independent from the mechanical contractor.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" forms stating that they will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.

2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions..
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with

calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.

5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

   a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.

5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.7 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus10 percent.
3. Cooling-Water Flow Rate: Plus or minus10 percent.

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.10 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

    a. Unit identification.

b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
j. Number of belts, make, and size.
k. Number of filters, type, and size.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Cooling coil static-pressure differential in inches wg.
g. Outside airflow in cfm.
h. Return airflow in cfm.
i. Outside-air damper position.
j. Return-air damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outside-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.

f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btuh.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm.
i. Face area in sq. ft..
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btuh.
b. Airflow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.

d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Test apparatus used.
d. Area served.
e. Air-terminal-device make.
f. Air-terminal-device number from system diagram.
g. Air-terminal-device type and model number.
h. Air-terminal-device size.
i. Air-terminal-device effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in .

3.11 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure water flow of at least 5 percent of units.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   d. Verify that balancing devices are marked with final balance position.
   e. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect/Engineer.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Architect/Engineer shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply, return and outdoor air.
2. Indoor, exposed supply, return and outdoor air.
3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Qualification Data: For qualified Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.
d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.

b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

A. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; CWP-1.
      2) GEMCO; CD.
      3) Midwest Fasteners, Inc.; CD.
      4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; CHP-1.
      2) GEMCO; Cupped Head Weld Pin.
      3) Midwest Fasteners, Inc.; Cupped Head.
      4) Nelson Stud Welding; CHP.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; RC-150.
      2) GEMCO; R-150.
      3) Midwest Fasteners, Inc.; WA-150.
      4) Nelson Stud Welding; Speed Clips.

   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

4. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) GEMCO.
        2) Midwest Fasteners, Inc.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.
4. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of vapor-barrier mastic at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of vapor-barrier mastic at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, return and outdoor air.
2. Indoor, exposed supply, return and outdoor air.
3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with Florida Energy Conservation Code.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Factory-insulated access panels and doors.

3.6 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

B. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

C. Concealed, rectangular, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

D. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

E. Exposed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

F. Exposed, rectangular, return-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

G. Exposed, rectangular, outdoor-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

H. Exposed, return-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

I. Exposed, outdoor-air plenum insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

END OF SECTION 23 07 13

SECTION 23 31 13 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall roundducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravityloads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.

7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support

intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 .
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches .

2.3 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.

2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg , positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 , "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch , plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches .

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive 1-inch wg.
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

    a. Pressure Class: Positive 2-inch wg .
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 6.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

    a. Pressure Class: Positive or negative 1-inch wg .
    b. Minimum SMACNA Seal Class: C.
    c. SMACNA Leakage Class for Rectangular: 24.
    d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

    a. Pressure Class: Positive or negative 2-inch wg.
    b. Minimum SMACNA Seal Class: B.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

    a. Pressure Class: Negative 1-inch wg .
    b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
    c. SMACNA Leakage Class for Rectangular: 12.
    d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg .
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg .
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm :

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.

c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

   a. Velocity 1000 fpm or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm : Conical tap.
   c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 33 00 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Flexible ducts.
4. Flexible connectors.
5. Duct accessory hardware.
6. Flange Connectors
7. Duct Mounted Access Door

1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Manual-volume dampers.
3. Flexible ducts.
4. Flange Connector
5. Duct Mounted Access Door

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 16 gauge, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 16 gauge, galvanized, sheet steel.
3. Blade Axles: Plated steel.
4. Tie Bars and Brackets: Galvanized steel.

C. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.3 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

C. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp, and 360 lbf/inch in the filling.

D. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp, and 440 lbf/inch in the filling.

2.4 FLEXIBLE DUCTS

A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.
2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
3. Inner Liner: Polyethylene film.
4. Flexible Duct: Technaflex, Flexmaster.

C. Pressure Rating: 6-inch wg positive, 1/2-inch wg negative.

2.5 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

   a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
   c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
   d. Access Doors Larger than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.

B. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Provide test holes at fan inlet and outlet and elsewhere as indicated.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct electric heater.
2. Upstream from duct filters.
3. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
4. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
5. At each change in direction and at maximum 50-foot spacing.
6. Control devices requiring inspection.
7. Elsewhere as indicated.

G. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

H. Install flexible connectors to connect ducts to equipment.

I. Ductwork flexible connectors are not required for internally isolated equipment.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 37 13 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Diffusers.

B. Registers/grilles.

1.2 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

C. ARI 650 - Air Outlets and Inlets.

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

E. SMACNA - Low Pressure Duct Construction Standard.

1.3 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

1.4 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

1.5 SUBMITTALS

A. Provide product data for items required for this project.

B. Submit schedule of outlets and inlets indicating type, size, location, application, and noise level.

C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

D. Submit manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CEILING DIFFUSERS

A. Titus

B. Tuttle and Bailey

C. Price

D. Metalaire.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Rectangular, adjustable pattern, fixed blade, stamped, multicore type diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated; Model TMSAA manufactured by Titus.

B. Provide surface mount, snap-in, or inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabricate of aluminum with baked enamel off-white finish.

2.3 ACCEPTABLE MANUFACTURERS - CEILING REGISTERS/GRILLES

A. Price.

B. Tuttle and Bailey.

C. Titus.

2.4 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Streamlined aluminum construction, 3/4 inch spacing, 35 degree fixed blades, 1-inch thick filter with ¼ turn fasteners, horizontal face; Model 355FF1 manufactured by Titus.

B. Fabricate 1-1/4 inch margin frame with concealed mounting.

C. Fabricate of aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel off-white finish.

D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

E. All ceiling exhaust and return air register/grilles installed in a room with T-bar drop ceiling shall be T-bar drop in type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Insulate the top side of all T-bar lay-in grilles and diffusers.

G. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

H. Form closely fitted joints with exposed connections accurately located and secured.

I. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

J. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

K. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

END OF SECTION 23 37 13

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.
6. Commissioning requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 GENERAL REQUIREMENTS

A. Carefully examine General Conditions, other specification sections, and other drawings (in addition to DIVISION 26), in order to be fully acquainted with their effect on electrical work. Additions to the contract cost will not be allowed due to failure to inspect existing conditions.

B. Do all work in compliance with 2014 Florida Building Code with supplements, and the Codes adopted therein, including NFPA 70 (2011 NEC), 2011 Florida Fire Prevention Code and the regulations of the local power utility, cable television and telephone companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like, and deliver such certificates to the Architect/Engineer.

C. Cooperate and coordinate with all other trades. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the condition of the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.

D. Furnish, perform, or otherwise provide all labor (including, but not limited to, all planning, purchasing, transporting, rigging, hoisting, storing, installing, testing, chasing, channeling, cutting, trenching, excavating and backfilling), coordination, field verification, equipment installation, support, and safety, supplies, and materials necessary for the correct installation of

complete and functional electrical systems (as described or implied by these specifications and the applicable drawings).

E. Coordinate and verify power and telephone company service requirements prior to bid. Bid to include all work required.

F. Circuiting and connection of all items using electric power shall be included under this division of the specifications, including necessary wire, conduit, circuit protection, disconnects and accessories. Secure rough-in drawings and connection information for equipment involved to determine the exact requirements. See all divisions of drawings or specifications for electrically operated equipment. If the connection of an item is not shown on the electrical drawings and it is unclear how to provide for the circuiting and connection, notify the engineer of record in writing prior to bidding project. Submission of a bid indicates that the bidder has included these requirements as part of the scope of work.

1.5 DRAWINGS:

A. Indicate only diagrammatically the extent, general character, and approximate location of work. Where work is indicated, but with minor details omitted, furnish and install it complete and so as to perform its intended functions.

B. DIVISION 26 work called for under any section of the project specifications, shall be considered as included in this work unless specifically excluded by inclusion in some other branch of the work. This shall include roughing-in for connections and equipment as called for or inferred. Check all drawings and specifications for the project and shall be responsible for the installation of all DIVISION 26 work.

C. Take finish dimensions at the job site in preference to scale dimensions. Do not scale drawings where specific details and dimensions for DIVISION 26 work are not shown on the drawings, take measurements and make layouts as required for the proper installation of the work and coordination with all drawings and coordination with all other work on the project. In case of any discrepancies between the drawings and the specifications that have not been clarified by addendum prior to bidding, it shall be assumed by the signing of the contract that the higher cost (if any difference in costs) is included in the contract price, and perform the work in accordance with the drawings or with the specifications, as determined and approved by the Architect/ Engineer, and no additional costs shall be allowed to the base contract price.

D. Carefully check the drawings and specifications of all trades and divisions before installing any of his work. He shall in all cases consider the work of all other trades, and shall coordinate his work with them so that the best arrangements of all equipment, piping, conduit, ducts, rough-in, etc., can be obtained.

E. Review the specific equipment (such as mechanical, plumbing, kitchen, FFE, etc) minimum circuit ampacity and maximum over current protection requirements of equipment provided by others to confirm it is properly coordinated with the devices being purchased. Notify the AE team immediately upon discovery of discrepancies. This shall be done at the submittal stage prior to purchasing over current protection or installation of conduit, wire, disconnects, breakers, etc. No cost will be allowed for changes to coordinate.

F. Locations designated for outlets, switches, equipment, etc., are approximate and shall be verified by instruction in these specifications and/or notes on the drawings. Where instructions or notes are insufficient to convey the intent of the design, consult the Architect/Engineer prior to installation.

G. Obtain manufacturer's data on all equipment, the dimensions of which may affect electrical work. Use this data to coordinate proper service characteristics, entry locations, etc., and to ensure minimum clearances are maintained.

1.6 QUALIFICATIONS OF CONTRACTOR:

A. DIVISION 26 Contractor shall have had experience of at least the same size and scope as this project, on at least two other projects within the last five years in order to be qualified to bid this project.

B. Contractor performing any part of this scope of work shall be a State Certified (Type E.C. License) electrical contractor

C. Provide field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable size and complexity. Superintendent shall be on the site at all times during construction and must have an active Journeyman's Electrical License.

1.7 SITE VISIT/CONDITIONS

A. Visit the site of this contract and thoroughly familiarize with all existing field conditions and the proposed work as described or implied by the contract documents. During the course of his site visit, verify every aspect of the proposed work and the existing field conditions in the areas of construction which might affect his work. No compensation or reimbursement for additional expenses incurred due to failure or neglect to make a thorough investigation of the contract documents and the existing site conditions will be permitted.

B. Install all equipment so that all Code required and Manufacturer recommended servicing clearances are maintained. Coordinate the proper arrangement and installation of all equipment within any designated space. If it is determined that a departure from the Contract Documents is necessary, submit to the A/E, for approval, detailed drawings of the proposed changes with written reasons for the changes. No changes shall be implemented without the issuance of the required drawings, clarifications, and/or change orders.

C. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered will not be recognized.

D. Existing conditions and utilities indicated are taken from existing construction documents, surveys, and field investigations. Unforeseen conditions probably exist and existing conditions shown on drawings may differ from the actual existing installation with the result being that new work may not be field located exactly as shown on the drawings. Field verify dimensions of all site utilities, conduit routing, boxes, etc., prior to bidding and include any deviations in the contract. Notify A/E if deviations are found.

E. All existing electrical is not shown. Become familiar with all existing conditions prior to bidding, and include in the bid the removal of all electrical equipment, wire, conduit, devices, fixtures, etc. that is not being reused, back to it's originating point.

F. Locate all existing utilities and protect them from damage. Pay for repair or replacement of utilities or other property damaged by operations in conjunction with the completion of this work.

G. Investigate site thoroughly and reroute all conduit and wiring in area of construction in order to maintain continuity of existing circuitry. Existing conduits indicated in Contract Documents indicate approximate locations. Verify and coordinate existing site conduits and pipes prior to any excavation on site. Bids shall include hand digging and all required rerouting in areas of existing conduits or pipes.

H. Work is in connection with existing buildings which must remain in operation while work is being performed. Work shall be in accord with the schedule required by the Contract. Schedule work for a minimum outage to Owner. Notify Owner 72 hours in advance of any shut-down of existing systems. Perform work during non-business operating hours unless otherwise accepted by Owner. Protect existing buildings and equipment during construction.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Engineer shall have no responsibility for job site safety and the Contractor shall have full and sole authority for all safety programs and precautions in connection with the Work. Nothing herein shall be interpreted to confer upon the Engineer any duty regarding safety or the prevention of accidents at the jobsite.

B. Comply with NECA 1.

C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

F. Right of Way: Give to piping systems installed at a required slope.

G. All work shall be executed in a workmanship manner and shall present a neat mechanical appearance upon completion.

H. Care shall be exercised that all items are plumb, straight, level.

I. Care shall be exercised so that Code clearance is allowed for all panels, controls. etc., requiring it. Do not allow other trades to infringe on this clearance.

J. Balance load as equally as practicable on all feeders, circuits and panel buses.

K. The electrical circuits, components and controls for all equipment are selected and sized based on the equipment specified. If substitutions are proposed, furnish all materials and data required to prove equivalence. No additional charges shall be allowed if additional materials, labor, connections or equipment are needed for substituted products.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Coordinate with roofing scope of work for the installation of electrical items which pierce roof. Roof penetrations shall not void warranty. Pitch pockets are not acceptable.

D. Where work pierces waterproofing, it shall maintain the integrity of the waterproofing. Coordinate roofing materials which pierce roof for compatibility with membrane or other roof types.

E. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

F. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

G. Cut sleeves to length for mounting flush with both surfaces of walls.

H. Extend sleeves installed in floors **2 inches** above finished floor level.

I. Size pipe sleeves to provide **1/4-inch** annular clear space between sleeve and raceway or cable, unless indicated otherwise.

J. Seal space outside of sleeves with grout for penetrations of concrete and masonry

K. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

L. Fire-Rated-Assembly Penetrations: Firestop penetrations of walls, partitions, ceilings, and floors under Division 07 Section "Firestopping."

M. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work. The use of pitch pockets is not acceptable.

3.3 CONCRETE PADS

A. Furnish and install reinforced concrete housekeeping pads for transformers, switchgear, motor control centers, and other free-standing equipment. Unless otherwise noted, pads shall be four (4) inches high and shall exceed dimensions of equipment being set on them, including future

sections, by three (3) inches each side, except when equipment is flush against a wall where the side against the wall shall be flush with the equipment.

B. Provide concrete pad for exterior pad mount transformers as required by power company.

C. Provide concrete pad for exterior generators as recommended by generator manufacturer and structural engineer (8" minimum).

END OF SECTION 26 05 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Provide type and UL listing of each type of conductor, cable, connector and termination to be utilized for the DIVISION 26 scope of work.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled as defined in NFPA 70, Article 100.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Engineer.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. BUILDING WIRES AND CABLES

1. CONDUCTOR INSULATION

a. Comply with NEMA WC 70 for Types THHN-THWN
b. Service Entrance: Type THHN-THWN CU or XHHW-2 Al, single conductors in raceway.
c. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.
d. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
e. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway.
f. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.
g. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC (MC may only be utilized in certain specific installations as described elsewhere in this section).
h. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway. Minimum #12.
i. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway. Minimum #12.
j. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
k. Class 1 Control Circuits: Type THHN-THWN, in raceway.
l. Class 2 Control Circuits: Type THHN-THWN, in raceway.

2. CONDUCTOR MATERIAL:

a. Copper Conductors: Comply with NEMA WC 70.
b. All #10 and smaller conductors shall be solid CU. No stranded conductors are permitted for #10 and smaller.
c. Aluminum conductors may be used for 1/0 and larger panel board feeders if identified as aluminum on the electrical feeder schedule. Aluminum conductors shall be compact stranded aluminum alloy with XHHW-2 insulation, made of an AA-8000 series electrical grade aluminum alloy conductor material.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. AMP Incorporated
3. Anderson
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M; Electrical Products Division.
6. Burndy

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. Aluminum connections shall be made with compression type wire barrels factory prefilled with oxide inhibiting compound. Set screw connectors are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION OF CONDUCTORS AND CABLES IN RACEWAY

A. No cables shall be installed in raceways until the raceway system is complete from end to end.

B. Examine raceways and building finishes to confirm compliance with contract requirements for installation tolerances and other conditions affecting installation of wires and cables. Do not proceed with installation until area is ready and any unsatisfactory conditions have been corrected.

C. Verify that interior of building has been protected from weather.

D. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

G. All branch circuit wire shall be sized for a maximum voltage drop of 3%. The contractor shall size all cables to comply with this requirement. Below are some guidelines that may be followed to achieve the correct voltage drop in lieu of providing custom calculations for each case.
1. Use conductor not smaller than #12 AWG for all 120V 20A branch circuits less than 60’ in length from the source breaker to any device.
2. All 120V branch circuit conductors where the length is 61’ to 120’ from the source breaker to any device shall utilize #10 minimum throughout the circuit, unless otherwise noted.
3. All 120V branch circuit conductors where the length is 121’ to 240’ from the source breaker to any device shall utilize # 8 minimum throughout the circuit, unless otherwise noted.

4. All 120V branch circuit conductors where the length is greater than 241' from the source breaker to any device shall utilize # 6 minimum throughout the circuit, unless otherwise noted.
5. Use conductor not smaller than #12 AWG for all 277V 20A branch circuits less than 140' in length from the source breaker to any device.
6. All 277V branch circuit conductors where the length is 141' to 220' from the source breaker to any device shall utilize #10 minimum throughout the circuit, unless otherwise noted.
7. All 277V branch circuit conductors where the length is 221' to 340' from the source breaker to any device shall utilize # 8 minimum throughout the circuit, unless otherwise noted.
8. All 277V 20A branch circuit conductors where the length is greater than 341' from the source breaker to any device shall utilize # 6 minimum throughout the circuit, unless otherwise noted.

H. Provide a dedicated neutral conductor for all dimmer circuits from the load back to the dimmer module or switch.

I. Provide a dedicated neutral conductor for all computer receptacle circuits from the load back to the branch circuit panel board.

J. Neatly train and lace wiring inside boxes, equipment, and panelboards.

K. Conductor sizes indicated on circuit homeruns or in schedules shall be installed over the entire length of the circuit unless noted otherwise on the drawings or in these specifications.

L. Before installing raceways and pulling wire to any mechanical equipment, verify electrical characteristics with final submittal on equipment to assure proper number and AWG of conductors. (As for multiple speed motors, different motor starter arrangements, etc.).

M. Coordinate all wire sizes with lug sizes on equipment, devices, etc. Provide/install lugs as required to match wire size.

3.2 CONNECTIONS

A. Where oversized conductors are called for (due to voltage drop, etc.) provide/install lugs as required to match conductors, or provide/install splice box, and splice to reduce conductor size to match lug size.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

C. All aluminum connections shall be made with approved compression connectors before being connected to lugs. Conductors shall be cleaned with a wire brush immediately prior to connecting.

D. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

F. Power and lighting conductors shall be continuous and unspliced where located within conduit. Splices shall occur within troughs, wireways, outlet boxes, or equipment enclosures where sufficient additional room is provided for all splices. No splices shall be made in in-ground pull boxes (without written acceptance of engineer).

G. Splices in lighting and power outlet boxes, wireway, and troughs shall be kept to a minimum, pull conductors through to equipment, terminal cabinets, and devices.

H. No splices shall be made in junction box, and outlet boxes (wire No. 8 and larger) without written acceptance of Engineer.

I. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. A calibrated torque wrench shall be used for all bolt tightening.

J. All interior power and lighting taps and splices in No. 8 or smaller shall be fastened together by means of "spring type" connectors. All taps and splices in wire larger than No. 8 shall be made with compression type connectors and taped to provide insulation equal to wire. Utilize weatherproof connectors for all splices in exterior boxes.

K. No splices are permitted in exterior below grade handhole or pull boxes.

3.3 FIELD QUALITY CONTROL

A. After feeders are in place, but before being connected to devices and equipment, test for shorts, opens, and for intentional and unintentional grounds.

B. Cables 600 volts or less in size #1/0 and larger shall be meggered using an industry approved “megger” with 1000 V internal generating voltage. Readings shall be recorded and submitted to the Engineer for acceptance prior to energizing same. If values are less than recommended NETA values notify Engineer. Submit five copies of tabulated megger test values for all cables.

C. Cables 250 volts or less in size #1/0 and larger shall be meggered using an industry approved “megger” with 500 V internal generating voltage. Readings shall be recorded and submitted to the Engineer, for acceptance prior to energizing same. Submit five copies of tabulated megger test values for all cables.

D. Perform Insulation resistance test and turns ratio test. Submit five copies to engineer at substantial completion.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems, equipment and common ground bonding with lightning protection system.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with UL 467 for grounding and bonding materials and equipment.

B. Test all ground rod locations as described to confirm quality standard intent is attained.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 4 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Lugs: Compression of substantial construction, cast copper or cast bronze, with "ground" (micro-flat) surfaces, twin clamp, two-hole tongue, equal to Burndy or equal by T&B or OZ Gedney. Lightweight and "competitive" devices shall be rejected.

E. Grounding and Bonding Bushings: Malleable iron, Thomas and Betts (T&B), or equal.

F. Grounding Screw and Pigtail: Raco No. 983 or equal.

G. Building Structural Steel, Existing: Thompson 701 Series heavy duty bronze "C" clamp with two-bolt vise-grip cable clamp or equal.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 5/8 inch by 10 feet in diameter.

2.4 GROUNDING BARS/GROUND BUS (INCLUDING 'SYSTEMS' GROUND BUS/BARS AND GROUND BUS BARS)

A. Ground bars shall be copper of the size and description as shown on the drawings. If not sized on drawings, bus bar shall be minimum 1/4" x 4" bus grade copper, spaced from wall on insulating 2" polyester molded insulator standoff/supports, and be 12" or greater minimum overall length, allowing 2" length per lug connected thereto. Increase overall length as required to facilitate all lugs required while maintaining 2" spacing. Size of bus bar used in main electrical room shall be similar except minimum of 4" high and 24" long.

B. Provide bolt-tapping lug with two hex head mounting bolts for each terminating ground conductor, sized to match conductors. Mount on bus bar at 2 inches on center spacing. Lugs to be manufactured by Burndy or T&B.

C. Standoff supports to be 2" polyester as manufactured by Glastic #2015-4C.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING CONDUCTOR

A. Provide separate, insulated (bare if with feeder in PVC conduit outside of building(s)) conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

B. Provide green insulated ground wire for all grounding type receptacles and for equipment of all voltages. In addition to grounding strap connection to metallic outlet boxes, a supplemental grounding wire and screw equal to Raco No. 983 shall be provided to connect receptacle ground terminal to the box.

C. All plugstrips and metallic surface raceway shall contain a green insulation ground conductor from supply panel ground bus connected to grounding screw on each receptacle in strip and to strip channel. Conductor shall be continuous.

D. All motors, all heating coil assemblies, and all building equipment requiring flexible connections shall have a green grounding conductor properly connected to the frames and extending continuously inside conduit with circuit conductors to the supply source bus with accepted connectors regardless of conduit size or type. This shall include Food Service equipment, Laundry equipment, and all other "Equipment By Owner" to which an electric conduit is provided under this Division.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

D. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Unistrut
2. Straps
3. Clamps
4. Rods

5. Hangers
6. Anchors
7. Attachment Devices

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. ERICO International Corporation.
c. Thomas & Betts Corporation.
d. Unistrut; Tyco International, Ltd.
e. Wesanco, Inc.

2. Metallic Coatings: Exterior of the building utilize stainless steel or hot-dip galvanized after fabrication and applied according to MFMA-4. Interior utilize electro-galvanized steel products.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper B-Line, Inc.; a division of Cooper Industries.
b. Fabco Plastics Wholesale Limited.
c. T & B/Carlon
d. Seasafe, Inc.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25percent in future without exceeding specified design load limits.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm)

thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.

6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

F. Do not support conduit or raceway with wire, metal banding material, or perforated pipe straps. Remove wire used for temporary supports

G. Do not attach conduit or raceway to ceiling support wires.

H. Conduits or raceways shall not be supported from ceiling grid supports, plumbing pipes, duct systems, heating or air conditioning pipes, or other building systems.

I. Non-bolted conduit clamps, spring type conduit clamps, and tie wire are not acceptable for supports. All conduits must be supported with bolted hangers listed for the specific installed application.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. LFNC: Liquidtight flexible nonmetallic conduit.

G. NBR: Acrylonitrile-butadiene rubber.

H. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

    a. Duct entry provisions, including locations and duct sizes.
    b. Frame and cover design.
    c. Grounding details.
    d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

1.5 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit - Zinc Coated

B. ANSI C80.3 - Electrical Metallic Tubing - Zinc Coated

C. ANSI C80.5 - Aluminum Rigid Conduit (ARC)

D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable

E. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

G. ANSI/NFPA 70 - National Electrical Code

H. NECA Standard Practices for Good Workmanship in Electrical Contracting

I. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit.

J. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit (EPC 40, EPC 80)

K. NEMA TC 3 -Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Minimum Trade Size

1. All Conduit (except switch legs) - 3/4"c.
2. Switch legs - 1/2"c.

B. RIGID METALLIC CONDUIT

1. Comply with:

    a. ANSI C80.1
    b. UL Spec - No. 6
    c. NEC 344

2. Conduit material:

    a. Zinc coated or hot dipped galvanized steel.

3. Fittings:

    a. Threaded.
    b. Insulated bushings shall be used on all rigid steel conduits terminating in panels, boxes, wire gutters, or cabinets, and shall be impact resistant plastic molded in an irregular shape at the top to provide smooth insulating surface at top and inner edge. Material in these bushings must not melt or support flame.
    c. Zinc plated or hot dipped galvanized malleable iron or steel.

4. Conduit Bodies:

    a. Comply with ANSI/NEMA FB 1.
    b. Threaded hubs.
    c. Zinc plated or hot-dipped galvanized malleable iron.

C. RIGID ALUMINUM CONDUIT

1. Comply with:

    a. ANSI C80.5
    b. UL 6
    c. NEC 344

2. Conduit material: Aluminum.
3. Fittings:

    a. Threaded.
    b. Aluminum.
    c. Insulated bushings on terminations.

4. Conduit bodies:

    a. Comply with ANSI/NEMA FB 1.
    b. Threaded hubs.
    c. Aluminum.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with:

    a. UL 6
    b. ANSI C80.1
    c. NEC. 344
    d. NEMA RN1

2. Conduit material: Hot-dipped galvanized rigid steel with external PVC coating, 20 mil. thick.
3. Fittings:

    a. Threaded.
    b. Insulated bushings on terminations.
    c. Zinc plated or hot-dipped galvanized malleable iron or steel with external PVC coating, 20 mil. thick.

4. Conduit bodies:

    a. Comply with:
    b. ANSI/NEMA FB 1
    c. Threaded hubs
    d. Zinc plated or hot-dipped galvanized malleable iron with external PVC coating 20 mil thick.

E. EMT: ANSI C80.3.

1. Comply with:

    a. UL 797
    b. ANSI C80.3
    c. NEC 358
    d. ANSI/UL797

2. Conduit material: Galvanized steel tubing.
3. Fittings:

    a. ANSI/NEMA FB 1
    b. Set screw, Die Cast for Interior Dry locations
    c. Compression, Steel for all damp locations

F. FMC: Zinc-coated steel or aluminum.

1. Comply with:

    a. NEC 348
    b. ANSI/UL 1

2. Conduit material: Steel or aluminum, interlocked.
3. Fittings:

    a. ANSI/NEMA FB 1
    b. ANSI/UL 514B
    c. Die Cast
    d. Threaded rigid conduit to flexible conduit coupling.
    e. Direct flexible conduit bearing set screw type not acceptable.

G. LFMC: Flexible steel conduit with PVC jacket.

1. Comply with:

    a. NEC 350

b. ANSI/UL 360

2. Conduit material:

a. Flexible hot-dipped galvanized steel core, interlocked.
b. Continuous copper ground built into core up to 1-1/4" size.
c. Extruded polyvinyl gray jacket.

3. Fittings:

a. Threaded for rigid conduit connections.
b. Accepted for hazardous locations where so installed.
c. Provide sealing washer in wet/damp locations.
d. Compression type.
e. ANSI/NEMA FB 1.
f. ANSI/UL 5148.
g. Zinc plated malleable iron or steel.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Minimum Trade Size – ¾”

B. RNC: NEMA TC 2, Schedule-40-PVC, unless otherwise indicated.

1. Comply with:

a. NEMA TC-2
b. UL 651
c. NEC 352

2. Conduit material:

a. Shall be high impact PVC - tensile strength 55 PSI, flexural strength 11000 PSI.

3. Fittings:

a. Comply with: NEMA TC-3 and UL 514.

2.3 EXPANSION FITTINGS

A. Expansion fittings shall be:

1. UL Listed, hot dipped galvanized inside and outside providing a 4" expansion chamber - when used with rigid conduit and electrical metallic conduit, or:
2. Be polyvinyl chloride and shall meet the requirements of and as specified elsewhere for non-metallic conduit and shall provide a 6" expansion chamber.
3. Hot dipped galvanized expansion fitting shall be provided with an external braided grounding and bonding jumper with accepted clamps, UL Listed for the application.
4. Expansion fitting, UL Listed for the application and in compliance with the National Electrical Code without the necessity of an external bonding jumper may be considered. Submit fitting with manufacturer's data and UL Listing for acceptance prior to installation.

2.4 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Engineer.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.
d. Mono-Systems, Inc.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.
3. Interior flush outlet boxes shall be one piece galvanized steel constructed with stamped knockouts in back and sides, and threaded holes with screws for securing box coverplates or wiring devices.
4. Ceiling outlet boxes shall be 4" octagonal or 4" square X 1 1/2" deep or larger as required for number and size of conductors and arrangement, size and number of conduits terminating at them.
5. Switch, wall receptacle, telephone and other recessed wall outlet boxes in drywall shall be a minimum of 4" square X 1 1/2" deep. For recessing in exposed masonry, provide one piece 4" square x 1 1/2" deep wall boxes with appropriate 4" square cut tile wall covers. For recessing in furred-out block walls, provide 4" square box with required extension for block depth and required extension for drywall depth.
6. Boxes shall be of such form and dimensions as to be adapted to the specific use and location, type of device or fixtures to be used, and number and size of conductors and arrangement, size and number of conduits connecting thereto.
7. Handy boxes shall not be used for any purpose.
8. Where a box is used as the sole support for a ceiling paddle fan, the box must be listed for this purpose and the weight of the fan.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

1. Interior surface outlet boxes and conduit bodies installed from 0" AFF to 90" AFF (including fire alarm device backbox) shall be the heavy cast aluminum or iron with external threaded hubs for power devices and threaded parts for low voltage devices. Trim rings shall also be of one-piece construction.
2. Weatherproof outlet boxes shall be constructed of corrosion-resistant cast metal suited to each application and having threaded conduit hubs, cast metal faceplate with spring-hinged waterproof cap suitable configured, gasket, and corrosion-proof fasteners.
3. Freestanding cast boxes are to be type FSY (with flange). Other cast zinc boxes are not acceptable.

D. Floor Boxes:
1. For all slab on grade areas except wet locations and wooden floors: Cast iron or steel with epoxy paint, fully adjustable before and after the concrete pour. The cover shall provide protection from water, dirt and debris. The cover will be flanged die cast aluminum with brushed aluminum finish that will accept carpet or tile cutouts to match flooring. The box shall be capable of adapting to most power and communications needs. Provide all activations, barriers and brackets required for the particular installation. Design Selection is Wiremold RFB 4 (based on required outlets) or equal.
2. Wood Floors: Cast iron or steel fully adjustable, rectangular, multi-gang box. The cover shall provide protection from water, dirt and debris. The cover will be brass flip lids with appropriate multi gang ring to set flush with wood flooring. The box shall be capable of adapting to most power and communications needs.
3. Poke Thru's for all floor boxes in elevated slabs: Flush style round poke thru with combination power (2 duplex) and data (6 Cat6 outlets). Poke Thru shall be UL scrub water exclusion for tile and carpeted floors. Poke thru shall be maintains UL fire rated for up to 2 hour rated floors. Poke thru shall meet FBC and ADA accessibility guidelines.

E. Sheet Metal Pull and Junction Boxes: NEMA OS 1.

1. Pull and junction boxes (not in-ground type) larger than 25 square inches shall be hinged cover type with flush latches operated with screwdriver.
2. Large Pull Boxes: Boxes larger than 400 cubic inches in volume or 20 inches in any dimension:

    a. Use continuous hinged enclosures with locking handle.

3. Exterior, damp location and wet location pull and junction boxes shall be Nema 4x stainless steel.

F. Cabinets (Control and Systems):

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Metal barriers to separate wiring of different systems and voltage.
4. Accessory feet where required for freestanding equipment.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Concrete ring with Nema 6P box inside (All Areas)

1. Color of Frame and Cover: Gray.
2. Configuration: Concrete ring shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural traffic load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC.", "TELEPHONE." or as indicated for each service.
6. Nema 6P box rated for direct burial enclosure shall be located inside the concrete ring for termination of conduits.
7. Handholes 36 inches wide by 36 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

PART 3 - EXECUTION

3.1 RACEWAY LOCATION INSTALLATION REQUIREMENTS

A. Underground Installations:

1. Use rigid non-metallic conduit (PVC) only unless local authority having jurisdiction or applicable codes/utility requirements, etc. require rigid steel conduit.
2. All conduits or elbows entering, or leaving the ground shall be rigid steel conduit coated with asphaltic paint.
3. All underground raceways (with exception of raceways installed under floor slab) shall be installed in accordance with the NEC except that the minimum cover for any conduit shall be two feet. Included under this Section shall be the responsibility for verifying finished lines in areas where raceways will be installed underground before the grading is complete.

4. Where rigid metallic conduit is installed underground as noted above it shall be coated with waterproofing black mastic before installation, and all joints shall be re-coated after installation.
5. Utilize rigid steel 90° elbows at each riser and at each change in direction. Elbows shall be coated with black mastic or PVC coating. Bond all metal elbows per NEC.
6. All underground service lateral raceways shall be protected as required by the NEC including requirements for installation of warning tape.

B. In Slab Above or on Grade:

1. Use coated rigid steel conduit or rigid non-metallic conduit.
2. Coating of metallic conduit to be black asphaltic or PVC.

C. Penetration of Slab:

1. Exposed Location subject to damage:

a. Where penetrating a floor in an exposed location subject to damage from underground or in slab, a black mastic coated or PVC coated galvanized rigid steel conduit shall be used.

2. Interior Location not subject to damage:

a. Where penetrating a floor in a location concealed in block wall and acceptable by applicable codes, rigid non-metallic conduit may be used up to first outlet box, provided outlet box is at a maximum height of 40" above finished floor.
b. Where penetrating a floor in location other than that above, transition to metallic conduit at the floor.

D. Outdoor Location:

1. Above Grade:

a. Where penetrating the finished grade, black mastic coated or PVC coated galvanized rigid steel conduit shall be used.
b. In general all exterior conduit runs shall be rigid steel conduit and threaded connectors as specified elsewhere.
c. Electrical metallic tubing (thin wall) is permitted under roof, overhangs, etc. provided it is not subjected to physical damage and is not in direct contact or directly subject to exterior elements including sunlight.

2. Metal Canopies:

a. Conduit runs except for canopy lighting raceways are not to be run on (top or bottom) of metal canopies roof systems. All new conduit shown on or at these areas is to be run underground. Clamp back spacers shall be used on all canopies to prevent galvanic action from dissimilar metals. Conduits installed exposed from Building structure to Metal Canopies will not be permitted.

3. Roofs:

a. Conduit is not to be installed on roofs, without written authorization by A/E and the Owner for specific conditions.
b. When accepted by written authorization conduit shall comply with the following:

1) Be PVC coated rigid galvanized metal conduit.
2) All fittings, etc. are to be PVC coated.
3) Conduit shall be supported above roof at least 6 inches using accepted conduit supporting devices. Refer to applicable sections of specifications on roofing, etc.
4) Supports to be fastened to roof using roofing adhesive or means compatible with roofing. Confirm the method used will not void the roofing warranty. The use of pitch pockets is not acceptable.

E. Interior Dry Locations:

1. Concealed: Use rigid galvanized steel conduit and electrical metallic tubing. Rigid non-metallic conduit may be used inside block walls up to first outlet to a maximum of 40" A.F.F. except where prohibited by the NEC (places of assembly, etc.).
2. Exposed: Use rigid galvanized steel or electrical metallic tubing. EMT may only be used where not subject to damage, which is interpreted by this specification to be above 90" AFF.
3. Concealed or exposed flexible conduit:

a. Concealed flexible steel conduit or seal tight flexible steel conduit in lengths not longer than six (6) feet in length with a ground conductor installed in the conduit or an equipment ground conductor firmly attached to the terminating fitting at the extreme end of the flex. Exposed flexible steel conduit or seal tight flexible steel conduit shall not exceed two (2) feet in length, unless written authorization by A/E for specific conditions is granted.

F. Interior Wet and Damp Locations:

1. Use rigid galvanized steel conduit.

G. Concrete Columns or Poured in-place Concrete Wall Locations:

1. Use rigid non-metallic conduit. Penetration shall be by accepted metal raceway (i.e. metal conduit as required elsewhere in these specifications).

3.2 RACEWAY INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. All bending, cutting, and reaming shall be completed with tools specifically designed for the specific use.

C. Expansion fittings shall be installed in the following cases:

1. In each conduit run wherever it crosses an expansion joint in the concrete structure; on one side of joint with its sliding sleeve end flush with joint, and with a length of bonding jumper in expansion equal to at least three times the normal width of joints.
2. In each conduit run which mechanically attached to separate structures to relieve strain caused by shift on one structure in relation to the other.
3. In straight conduit run above ground which is more than one hundred feet long and interval between expansion fittings in such runs shall not be greater than 100 feet.

D. Arrange conduit to maintain headroom and present neat appearance.

E. Provide rigid steel long radius 90 degree sweeps (bend radius of 10 times the conduit trade size diameter) for all changes in direction (vertical and horizontal) for utility conduits. Comply with all installation requirements of the utility to utilize the conduits.

F. Utility conduits shall be buried a minimum of 36” deep to the top of the conduit.

G. Route conduit installed above accessible ceilings or exposed to view parallel or perpendicular to walls. Do not run from point to point.

H. Do not cross conduits in slab.

I. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

J. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

K. Complete raceway installation before starting conductor installation.

L. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

M. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

N. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.

O. Provide continuous fiber polyline 1000 lb. minimum tensile strength pull string in each empty conduit except sleeves and nipples. This includes all raceways which do not have conductors furnished under this Division of the specifications. Pull cord must be fastened to prevent accidental removal.

P. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Q. Rigid steel box connections shall be made with double locknuts and bushings.

R. Spare conduit stubs shall be capped and location and use marked with concrete marker set flush with finish grade. Marker shall be 6" round x 6" deep with appropriate symbol embedded into top to indicate use. Also, tag conduits in panels where originating.

S. Spare conduit stubs shall be capped with a UL listed and accepted cap or plug for the specific intended use and identified with ink markers as to source and labeled "Spare."

T. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

U. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

V. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

W. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

X. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Z. All raceway runs in masonry shall be installed at the same time as the masonry so that no face cutting is required, except to accommodate boxes.

AA. Raceways shall not be routed through stairwells, elevator shafts, elevator machine rooms or fire pump rooms unless the conduit is for use within that space.

BB. Raceways installed in hazardous locations shall be installed in accordance with the appropriate provisions of NEC chapter 5 for that location. Confirm the appropriate space rating with life safety plans.

CC. All raceway runs, whether terminated in boxes or not, shall be capped during the course of construction and until wires are pulled in, and covers are in place. No conductors shall be pulled into raceways until construction work which might damage the raceways has been completed.

DD. Electrical raceways shall be supported independently of all other systems and supports, and shall in every case avoid proximity to other systems which might cause confusion with such systems or might provide a chance of electrolytic actions, contact with live parts or excessive induced heat.

EE. Excavate trench bottom to provide firm and uniform support for conduit installed underground. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter. Install backfill as specified in Division 31 Section "Earth Moving."

FF. After installing underground conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."

3.3 BOX INSTALLATION

A. Set metal floor boxes level and flush with finished floor surface.

B. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

C. Install electrical boxes as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

D. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

E. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

F. Install boxes to preserve fire resistance rating of partitions and other elements.

G. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

H. Outlets for 120V clocks shall be recessed so that the clock will hang flush with the finished surface of the wall.

I. Use flush mounting outlet boxes in finished areas.

J. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic and fire rated walls.

K. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

L. Use stamped steel bridges to fasten flush mounting outlet box between studs.

M. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

N. Support all outlet boxes from structure with minimum of one (1) 3/8" all-thread rod hangers. Boxes larger than 25 square inches shall be supported with two (2) all-thread rod hangers, minimum.

O. Do not fasten boxes to ceiling support wires.

P. Use multi-gang box where more than one device is mounted together. Do not use sectional box.

Q. Boxes in exterior walls shall be flush mounted. Use cast outlet box in exterior locations and wet locations where flush mounting is not possible.

R. Install outlets in the locations shown on the drawings; however, the Owner shall have the right to make, prior to rough-in, slight changes in locations to reflect room furniture layouts.

S. Coordinate work with all divisions so that each electrical box is the type suitable for the wall or ceiling construction provided and suitable fireproofing is inbuilt into fire rated walls.

T. All boxes shall be installed in a flush rigid manner with box lines at perpendicular and parallel angles to finished surfaces. Boxes shall be supported by appropriate hardware selected for the type of surface from which the box shall be supported. For example, provide metal screws for metal, wood screws for wood, and expansion devices for masonry or concrete.

U. For locations exposed to weather or moisture (interior or exterior), provide weatherproof boxes and accessories.

V. As a minimum, provide pull boxes in all raceways over 150 feet long. The pull box shall be located near the midpoint of the raceway length.

W. Provide knockout closures to cap unused knockout holes where blanks have been removed, and plugs for unused threaded hubs.

X. Provide conduit locknuts and bushings of the type and size to suit each respective use and installation.

Y. Boxes and conduit bodies shall be located so that all electrical wiring is accessible.

Z. Avoid using round boxes where conduit must enter box through side of box, which would result in a difficult and insecure connection with a locknut or bushing on the rounded surface.

AA. All flush outlets shall be mounted so that covers and plates will finish flush with finished surfaces without the use of shims, mats or other devices not submitted or accepted for the purpose. Add-a-Depth rings or switch box extension rings are not acceptable. Plates shall not support wiring devices. Gang switches with common plate where two or more are indicated in the same location. Wall-mounted devices of different systems (switches, thermostats, etc.) shall be coordinated for symmetry when located near each other on the same wall. Outlets on each side of walls shall have separate boxes. Through-wall type boxes shall not be permitted. Back-to-back mounting shall not be permitted. Trim rings shall be extended to within 1/8" of finish wall surface.

BB. Outlet boxes mounted in metal stud walls, are to be supported to studs with two (2) screws inside of outlet box to a horizontal stud brace between vertical studs or one side of outlet box supported to stud with opposite side mounted to section of stud or device to prevent movement of outlet box after wall finished.

CC. All outlet boxes that do not receive devices in this contract are to have blank plates installed matching wiring device plates.

DD. Height of wall-mounted fixtures shall be as shown on the drawings or as required by Architectural plans and conditions. Fixture outlet boxes shall be equipped with fixture studs when supporting fixtures.

EE. Locate special purpose outlets as indicated on the drawings for the equipment served. Location and type of outlets shall be coordinated with appropriate trades involved. The securing of complete information for proper electrical roughing-in shall be included as work required under this section of specifications. Provide plug for each outlet.

FF. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only within a 24” wall space and that openings do not exceed 16 sq. inches. All clearances between such outlet boxes and the gypsum board must be completely filled with joint compound.

GG. Fire-Barrier Penetrations: Firestop penetrations under division 07 Section “Firestopping”.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In all areas, set so cover surface will be flush with finished grade.

3.5 INSTALLATION OF WIREWAYS

A. Do not install wireways as a substitute for proper coordination and layout of conduit stub ups to panels. Prior authorization from the engineer is required prior to installation of any wireways.

B. Do not make splices in wireways. All wires must be pulled through without splice or termination.

C. Install wireway to maintain headroom and to present neat mechanical appearance.

D. Support wireway independently of conduit.

E. Wireway shall be located so that all electrical wiring is accessible.

END OF SECTION 26 05 33

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY, BOX AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

B. Primed and Painted band 4” in length.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

C. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Safety Signs: Comply with 29 CFR, 1910.145.

B. Nameplates shall be laminated phenolic plastic, chamfer edges.

1. For 120/208 Volt System:

   a. Black front and back with white core, with lettering etched through the outer covering. White engraved letters on Black background.

2. For 277/480 Volt System:

   a. Orange front and back with white core with lettering etched through the outer covering. White engraved letters on Orange background.

3. For Emergency System:

   a. Red front and back with white core with lettering etched through the outer covering. White engraved letters on red background.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength: 50 lb (22.6 kg), minimum.
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
2. Concealed Boxes: Plasticized card-stock tags.
3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.

1. Color-code 208/120-V system as follows:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White.
e. Ground: Green.
f. Switchlegs(load side of contactor or relay is not considered a switchleg): Purple

2. Color-code 480/277-V system as follows:

a. Phase A: Brown
b. Phase B: Orange
c. Phase C: Yellow
d. Neutral: White with a colored stripe or gray.
e. Ground: Green.
f. Switchleg(load side of contactor or relay is not considered a switchleg): Pink

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 6 AWG:

a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

N. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction

signs with approved legend where instructions are needed for system or equipment operation.

2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled: Include as a minimum the equipment identification (first line ½"): voltage rating and amperage rating (second line 3/8"): where it is fed from (third line 3/8"). (Example :Panel CP1 (Line 1), 208/120V 3ph, 4w, 225A(line 2), fed from swbd MDP-1 (Line 3))

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Electrical switchgear and switchboards.
d. Transformers.
e. Electrical substations.
f. Emergency system boxes and enclosures.
g. Motor-control centers.
h. Disconnect switches.
i. Enclosed circuit breakers.
j. Motor starters.
k. Push-button stations.

3.2 SWITCHGEAR BREAKERS

A. Provide labels for each breaker to identify the load served.

3.3 CONDUIT/JUNCTION BOX COLOR CODE

A. All conduit system junction boxes (except those subject to view in public areas) shall be color coded as listed below:

B. Color Code for Junction Boxes

1. System Emergency 277/480 volt — Orange/Brown
2. System Emergency 120/208 volt — Orange/Black

3.	Fire Alarm	Red
4.	Normal Power 277/480 volt	Brown
5.	Normal Power 120/208 volt	Black
6.	Fiber Optics	Purple
7.	Sound System	Yellow
8.	Clock	Light Blue
9.	Intercom	Blue
10.	Computer/Data	Gold
11.	TV	White
12.	Security/CCTV	Blue
13.	Ground	Fluorescent Green
14.	Telephone	Clover Green

C. Conduits (not subject to public view) longer than 20 feet shall be painted with above color paint band 30 ft. on center. Paint band shall be 4" in length. Where conduits are parallel and on conduit racking, the paint bands shall be evenly aligned. Paint shall be neatly applied and uniformed. Paint boxes and raceways prior to installation or tape conduits and surrounding surfaces to avoid overspray. Paint overspray shall be removed.

D. All new and existing junction boxes/cover plates for power, lighting and systems (except those installed in public areas) shall adequately describe it's associated panel and circuit reference number(s) within, (i.e. ELRW-2, 4, 6) or systems within (i.e. fire alarm, intercom. Etc.). Identification shall be by means of black permanent marker. (Paint ½ cover plate with appropriate color as noted in 2.3 above, and mark other ½ with associated panel/circuit or system description as described).

END OF SECTION 26 05 53

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Snap switches and wall-box dimmers.
5. Solid-state fan speed controls.
6. Pendant cord-connector devices.
7. Cord and plug sets.
8. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

B. Related Sections include the following:

1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Comply with NEMA WD 1.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.7 ALLOWANCES

A. Provide for twenty additional receptacles as directed in field. Allowance includes purchase, delivery and installation of box, receptacle cover plate, wire and 100 feet of conduit for each receptacle.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
2. Leviton Mfg. Company Inc. (Leviton).
3. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following for standard convenience outlets:

a. Hubbell; HBL5361 (single), HBL5352 (duplex).
b. Leviton; 5351 (single), 5352 (duplex).
c. Pass & Seymour; 5361 (single), 5352 (duplex).

2. Black Computer Power Duplex Receptacle:

a. Pass & Seymour Model PS5352-Black
b. Hubbell Model HBL5362-Black
c. Leviton Model 5362-Black

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and trip button to indicate when device is tripped. Face will not have power if reverse wired. Visual indication for device has lost capability to provide protection.

B. Outdoor locations provide weather resistant GFCI convenience receptacles, 125V, 20A - Black
1. Products: Subject to compliance with requirements, provide one of the following:
a. Hubbell #GFR5362WR
b. Pass & Seymour; 2095DSWRBK.
c. Leviton #W7899-E

C. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell #GFR5362
b. Pass & Seymour; 2095.
c. Leviton #6898

2.4 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper Crouse-Hinds.
b. EGS/Appleton Electric.
c. Killark; a division of Hubbell Inc.

2.5 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL2310.
b. Leviton; 2310.
c. Pass & Seymour; L520-R.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.8 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Snap switches for general use shall be maintained contact types, and shall be single-pole, double-pole, three-way, or four-way as required for the specific switching arrangements shown on the drawings. They shall be quiet tumbler operation types, having silver alloy contacts, and meeting all NEMA performance standards.

C. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL1221 (single pole), HBL1222 (two pole), HBL1223 (three way), HBL1224 (four way).
b. Leviton; 1221 (single pole), 1222 (two pole), 1223 (three way), 1224 (four way).
c. Pass & Seymour; PS20AC1 (single pole), PS20AC2 (two pole), PS20AC3 (three way), PS20AC4 (four way).

D. Pilot Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HPL1221PL for 120 V and 277 V.
b. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
c. Pass & Seymour; PS20AC1RPL for 120 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off." Provide red handle for switches connected to emergency power.

E. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL1221L.
b. Leviton; 1221L.
c. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle. All key operated switches shall be keyed alike.

F. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL1557.
b. Leviton; 1257.
c. Pass & Seymour; 1251.

G. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle. All keyed switches shall be keyed alike.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; HBL1557L.
b. Leviton; 1257L.
c. Pass & Seymour; 1251L.

2.9 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable toggle switch; with single-pole or three-way switching. Comply with UL 1472.

C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.

1. 600 W; dimmers shall require no derating when ganged with other devices.

D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.10 FAN SPEED CONTROLS

A. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters. Comply with UL 1917.

1. Continuously adjustable toggle switch, 5 A.
2. Three-speed adjustable slider, 1.5 A.

2.11 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. All wiring devices shall be provided with standard size one-piece cover plates of suitable configuration for the number and type of devices to be covered.
3. Metallic cover plates shall be used in interior spaces, except as noted below, and shall be fabricated of corrosion-resistant #302 stainless steel, having a nominal thickness of .04", and a brushed finish. Screws securing the plates shall have flush (when installed) heads with finish to match plates. Metallic cover plates shall meet all requirements of the National Electrical Code and Federal Specifications.
4. Cover plates for switches located in corrosive atmospheres (where vaporproof is not indicated) shall be equal to Hubbell #17CM81/#17CM82/#17CM83/#17CM84 one piece neoprene with matching presswitch.
5. Cover plate engraving, where required, shall be accomplished by cover plate manufacturer in accordance with instructions given on the drawings. Metallic plates shall be engraved with black fill. Red plates shall be engraved with white fill.
6. Material for Unfinished Spaces: Galvanized steel.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable “in use” cover. Cover plates for exterior receptacles shall be gasketed covers with hinge allowing plug and cord to be plugged in and activated with cover closed..

2.12 MULTIOUTLET ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold Company (The).
3. Mono-systems, Inc.

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Wire: No. 12 AWG.

2.13 SERVICE POLES

A. Description: Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.

1. Poles: Nominal 2.5-inch- (65-mm-) square cross section, with height adequate to extend from floor to at least 6 inches (150 mm) above ceiling, and with separate channels for power wiring and voice and data communication cabling.
2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
3. Finishes: Manufacturer's standard painted finish and trim combination.
4. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, 4-pair, Category 3 or 5 voice and data communication cables.
5. Power Receptacles: Two duplex, 20-A, heavy-duty, NEMA WD 6 configuration 5-20R units.
6. Voice and Data Communication Outlets: Four RJ-45 Category 6 jacks.

2.14 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70 or device listing.
2. Receptacle devices for computer power shall be black color.
3. Wiring Devices Connected to Emergency Power System: Red.
4. Modify any given catalog numbers as required to procure devices and plates of the proper color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

B. Install products in accordance with manufacturer's instructions.

C. Install devices plumb and level.

D. Install switches with OFF position down.

E. Provide device coverplates for every device installed. Cover plates shall be installed so that they appear straight with no gaps between plate edges and the wall. Maintain vertical and horizontal to within 1/16 of an inch

F. Wiring devices shall not be installed in exposed masonry until cleaning of masonry with acids has been completed.

G. All receptacles and switches shall be grounded by means of a ground wire from device ground screw to outlet box screw and branch circuit ground conductor. Strap alone will not constitute an acceptable ground.

H. All devices shall be installed so that only one wire is connected to each terminal.

I. Connect wiring devices by wrapping conductor around screw terminal.

J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

K. Install local room area wall switches at door locations on the lock side of the door, approximately four inches from the jamb. Where locations shown on the drawings are in question, provide written request for information to A/E prior to roughin.

L. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

M. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

N. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

O. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

P. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches or receptacles under multigang wall plates. Provide proper NEC barriers in boxes which serve devices for both the Normal and Emergency Systems.

Q. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 CONNECTIONS

A. Connect wiring device grounding terminal to outlet box with bonding jumper.

B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 NEUTRAL CONDUCTOR CONNECTIONS

A. At each receptacle "in" and "out" phase and neutral conductors shall have an additional conductor for connection to device. The practice of "looping" conductors through receptacle boxes shall not be acceptable. (IE: The device shall not be used to complete the circuit. Pigtails shall be used from the device)

3.4 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles and Switches: Identify panelboard and circuit number from which served. Use permanent marker to identify on the back of plates or tags within outlet boxes.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION 26 27 26